

THE IRON AGE

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THE SECRET OF INDUSTRIAL GROWTH

TIME performs many miracles in industry.

A few years may be sufficient to transform a modest little shop into a huge manufacturing plant where thousands labor.

An equally short period may be sufficient to shrink to mediocrity or completely dissipate the resources of organizations that were once powerful and flourishing.

What is the secret of industrial growth?

It does not lie in capital strength, for some of today's most successful concerns made their debut upon a financial pittance.

It is not luck. Good fortune may play an important part at times, but it is a poor dependence.

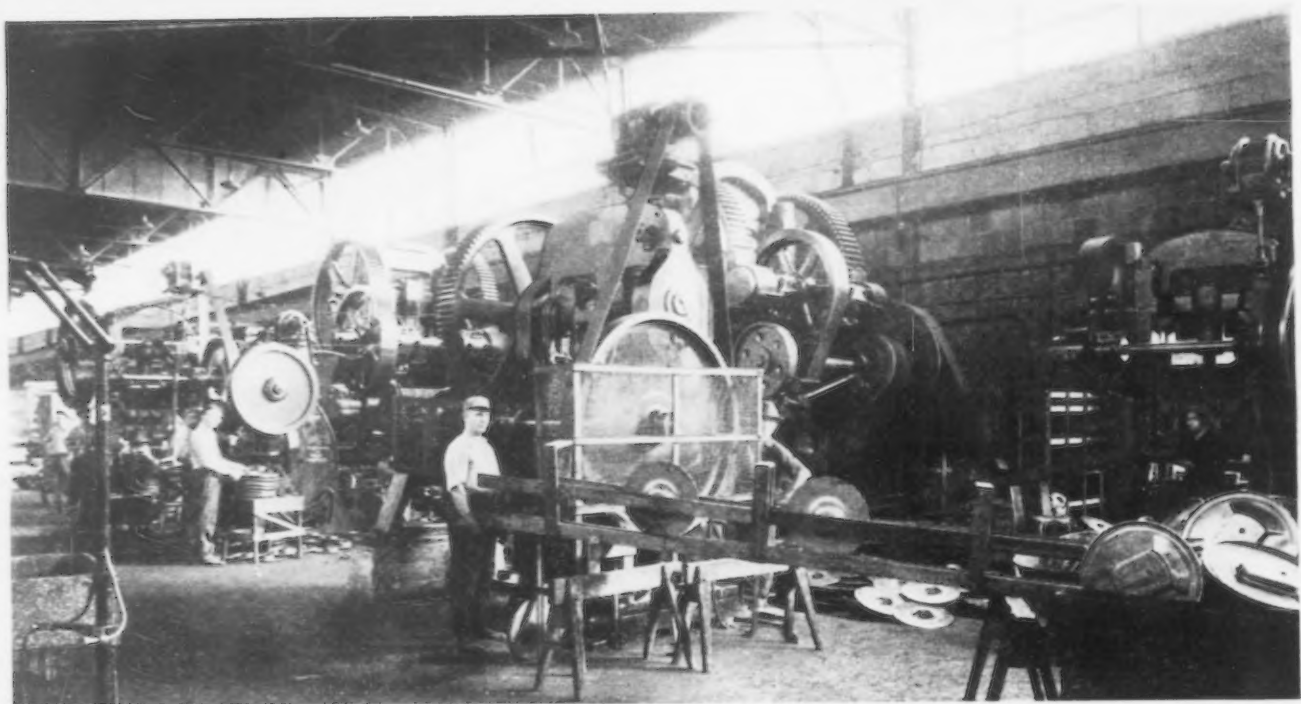
The secret of successful growth lies in the continual adjustment of product, plant and policies to the changing trends of the times. He makes the best speed who swims with the current.

How important it is, then, that the responsible men of industry shall have the clearest possible perspective of industrial progress and its trends.

The Seventy-Fifth Anniversary Number of The Iron Age,

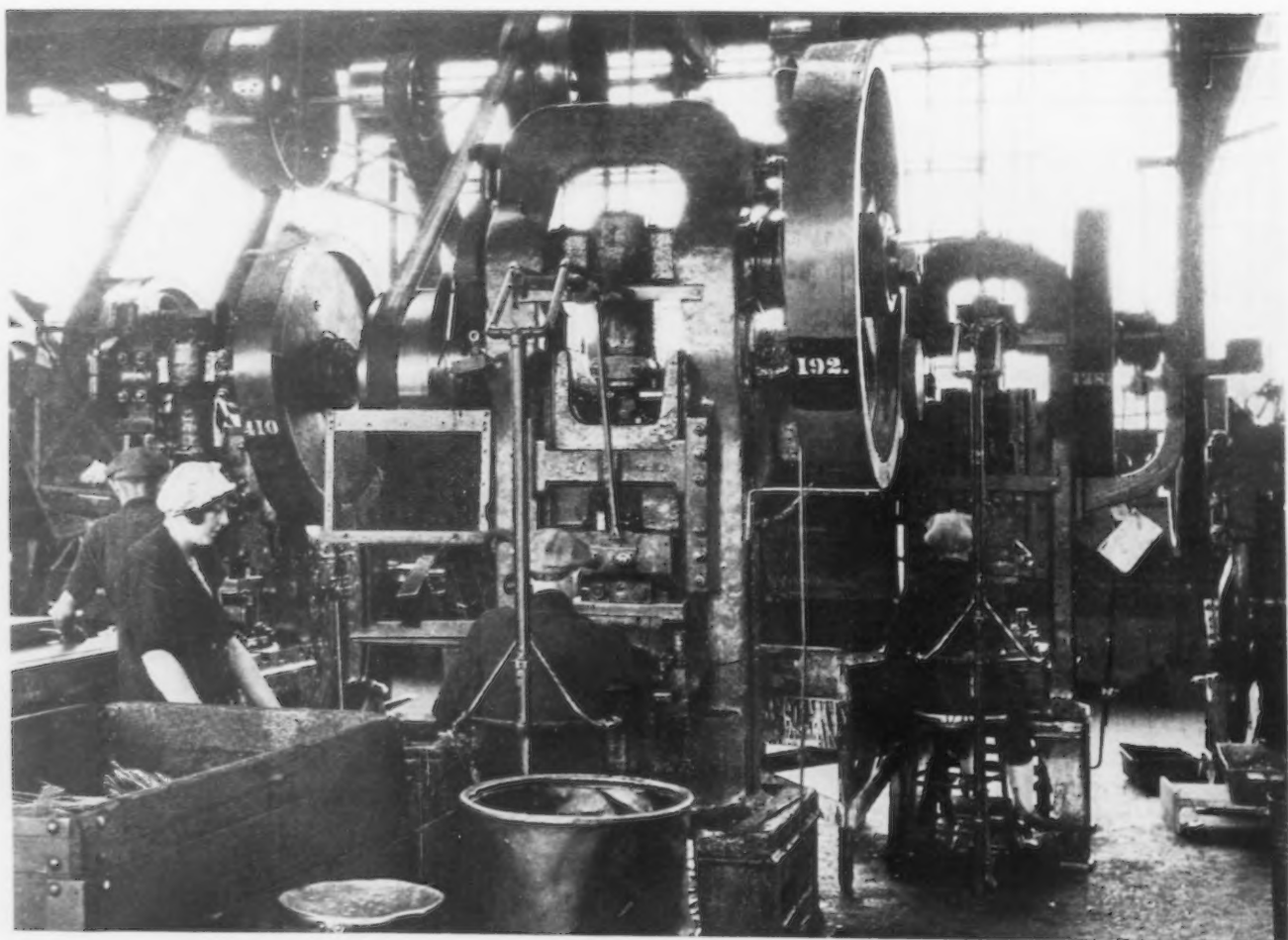
to be published next week, will present a new perspective of progress based upon three-fourths of a century of intimate weekly contact with the metal-working industry. Its purpose is to give a fundamental long-range view of trends which will aid our readers in interpreting developments and in shaping successful policies for the future.





GROUPING of seven machines into a production unit is shown above. Three of the presses are movable and are grouped, in respect to the four fixed-position machines and to each other, to form a progressive stamping unit. This press line-up in the Acklin Stamping Co. is for the manufacture of an automobile brake dust shield. The press operator at center, on taking the disk from his machine, sends it down the inclined runway to the press on which the succeeding operation is done.

Below is a picture taken in the light-stamping department, showing four machines, all movable, grouped together no two in line, but all driven from the same line shaft, for progressive stamping operations on a small piece. ▲ ▲ ▲



Migration of Presses Into Grouped Production Units

MOVING its stamping presses around the plant and grouping several together in temporary positions for progressive operations on a production order is a novel and what might be called a revolutionary practice that has been adopted by the Acklin Stamping Co., Toledo, Ohio. A job, under the plan now followed, with the presses arranged for successive operations, is kept moving from the first operation until it is finished.

Increased economies in production resulting from greatly reducing the manual labor of handling pieces in process, the elimination to a large extent of press helpers and the speeding up of output when several successive operations are required, caused the company to abandon the

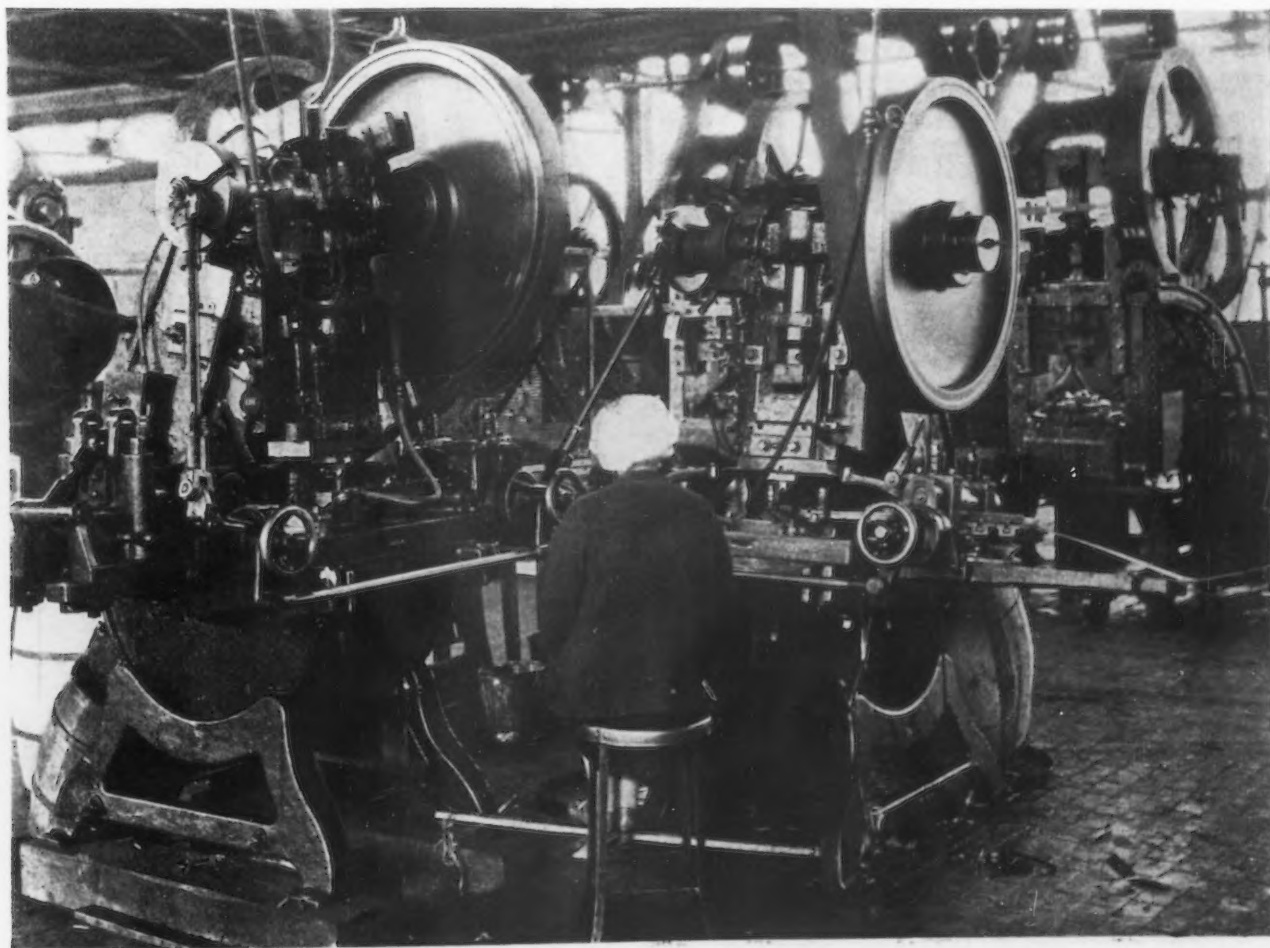
time-honored custom of having all of its press equipment in fixed position in straight lines.

Under the inflexible, fixed line-up, pieces often had to be moved a considerable distance from one press to another for successive operations. Presses in line made a neat appearance, but appearance in this plant has given way to economies in production methods.

Contiguous location of a battery of presses working on a production order has made possible another important saving in handling costs, in that presses of a unit, in as close positions as convenient for working, are connected by chutes or short elevators or conveyors that can be moved from one line-up to another.

On these the pieces are carried from one machine to the next

METHOD of grouping machines to effect economies in production. Two machines are placed side by side at right angles, permitting both presses to be operated by one girl by means of a wooden bar connected to both foot treadles.



machine for the various successive operations.

Another advantage of the system is that it provides a production line and there is a constant flow in production. Standard times are set for each job and lagging in work is avoided. If there is a stoppage at one point, due to a break or for a change in dies, the whole line usually stops, as it is found as a rule that it is more economical to shut down entirely than to keep a portion of the unit under temporary operation. Stacking of material at the side of the machine is eliminated, stock awaiting operations at one machine never being more than a few pieces, to take care of slight fluctuation in the production speeds of adjoining machines.

Group workmen are given two 5-min. fatigue periods, one in the morning and one in the afternoon. The principal purpose of this is to have the men leave their machines all at one time, rather than to interfere with production by being absent at different times.

Stock for a job is trucked, usually from the railroad car which brings it from the mill, to the first operation. If the job is about ready to start, the material goes direct from the truck to the first machine. All presses are equipped with registers to show the number of pieces produced.

Pieces scrapped because of laminated steel or for other reasons are thrown on the floor and picked up hourly by the salvage department. Those that can be salvaged are put back in production with very little delay. By keeping pieces moving without storage between operations, by registering production, checking rejections and

quick salvaging, the company is able to maintain an accuracy in the quantity produced and to avoid the loss of stampings.

The plant is divided into two departments—heavy stamping and light stamping—located in adjoining bays. The presses, all plain-type machines ranging in capacity from 15 to 1000 tons, may be divided into three classes. In the heavy-stamping department there are nine pit-type presses strategically permanently located, and 20 to 25 fairly large presses driven by attached motors. These are moved around for use in connection with the pit-type machines. The third group includes the small presses, about 85 in number, located in the light-stamping department. These smaller presses are all driven from a line shaft.

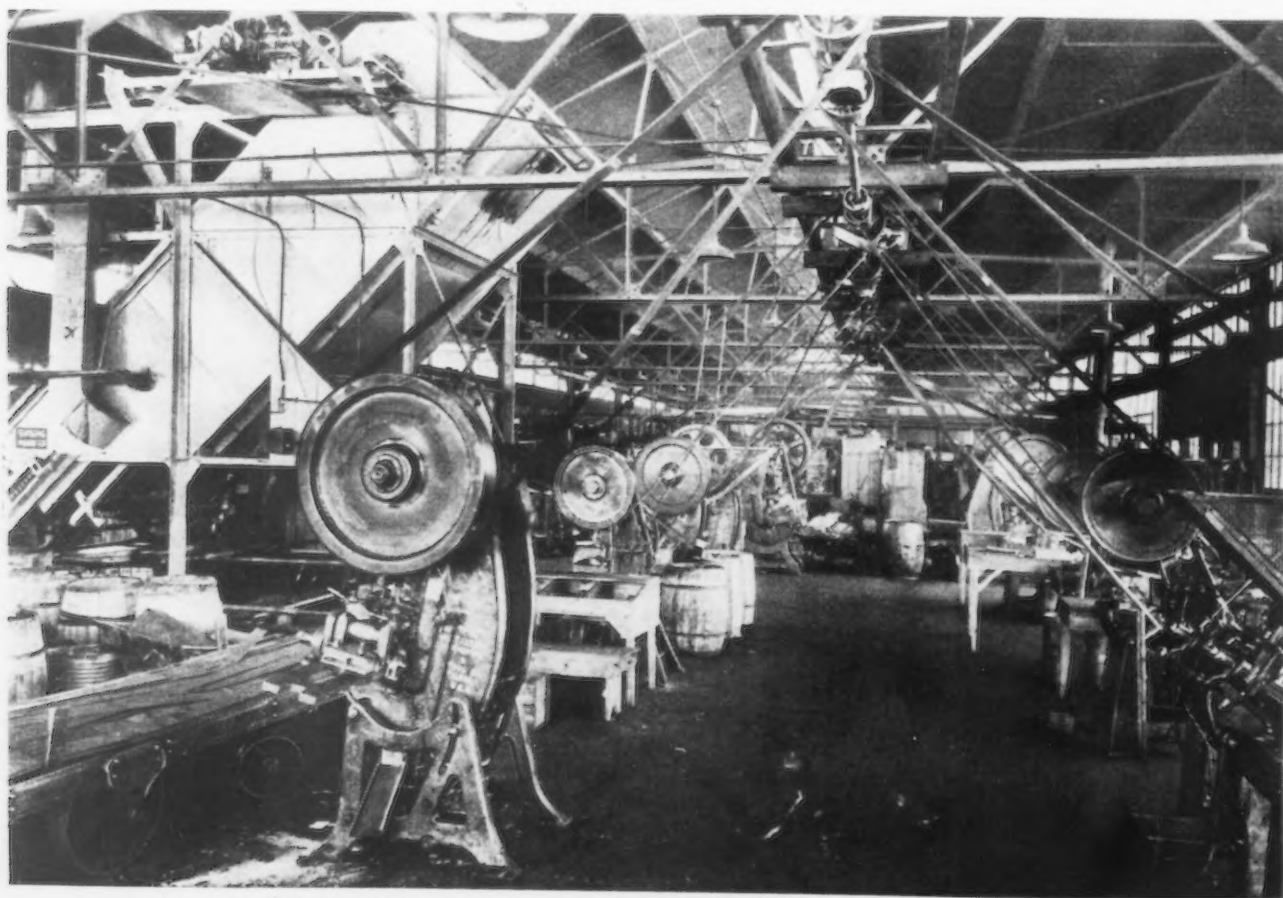
Presses moved to provide a line-up for a special job range in weight from 600 lb. to 4 tons and have capacities ranging up to 400 tons. Presses from 400 to 1000-ton capacity are in fixed positions.

How the Presses Are Moved to New Positions

MOVING the presses from place to place is done quickly and easily. The plant has a 2-in. wood-block floor laid on concrete. The movable presses are anchored in the wood blocks by means of four lag screws, one in each corner of the foot. While the weight of the press helps to hold it in position, the lag screws prevent any side movement. If a production job should be run continuously for six or eight months, as sometimes happens, the lag screws are leaded into the concrete.

Sometimes a press in the light-stamping department is jacked up under a hand lift for

GROUP of a number of presses for progressive stamping operations. These are in two rows but are not in line, and are all driven from one line-shaft.



moving. A gas-driven tractor is used for hauling the larger movable presses, but more often the lighter presses, weighing up to 2000 lb., are shoved around the floor by hand without the use of skids. The floor is smooth and the oil-soaked wood blocks are quite slippery, so that it does not require a great deal of muscle to push a press from place to place. The larger movable presses in the heavy-stamping department are moved by a 10-ton electric traveling crane that serves this bay. A 2½-ton hand crane is provided in this department for moving dies.

Moving the presses to provide a line-up for a new job is usually done during the noon hour or at night, so that production is not interfered with. A supply of extra pulleys in a wide range of sizes to take care of any job or speed is kept in storage for use on the line shaft in the light-stamping department. It takes the millwright only about 20 min. to put on a new pulley, which is usually done during the noon hour.

Presses are grouped for progressive operations on stampings whenever a production order is of sufficient size to warrant lining up the machines for the particular order. Usually the grouping is done when an order is for 50,000 or more small pieces, or 10,000 or more larger stampings. The movable presses in the heavy-stamping department are grouped around the larger fixed-position machines. The permanently-located machines usually are used for first operations of blanking or blanking and forming. The pieces then go to one or two of the smaller machines for secondary operations, and then back to one of the larger fixed-position presses for finished stamping.

Common press set-ups are three large fixed-position machines and two smaller movable presses, or two of the larger machines and three or four of the smaller, movable type. Usually machines are not grouped for only two-operation jobs unless the production order calls for a long run. However, if a two-operation job is to take more than one day, it is done as a rule on adjoining presses, even if it is necessary to delay starting the job until suitable presses are available side by side.

Flexibility of grouping of machines is accomplished by reversing or quarter-turning presses, crossing belts and using belts of different lengths as required by the location of the machines. This also permits operating more presses from one line shaft than would be possible were the machines permanently located along a straight line. An overhead air line has short drop connections at frequent intervals and there are hose lines from the latter for connection to the presses, making air available at any point at which a press may be located.

The press line-up for each job is made by the men

out in the shop who operate the machines or supervise production. They can best determine how the machines should be grouped to provide the most efficient arrangement. Perhaps after a job is started it may be found that the material may be handled a little

more easily by moving one machine a few inches or turning another at an angle.

Examples of Economic Grouping of Presses

ILLUSTRATING the practical application of the grouping of machines for progressive production, a pressed steel chain for a coin-in-a-slot vending machine is under production at present. This is made of cold-rolled strip stock 2½ in. wide. A complete chain is composed of 63 links and when assembled is 34 in. long. The oper-

ations in succession on machines grouped for the work are piercing two locating points and blanking on a progressive die, these two operations being done on one machine, tumbling in a barrel to clean the surface and remove burrs, forming and piercing, two machines being used for each as these are slow operations, and finally after assembling (the links being connected together with pins, a manual operation), clinching the ends of the pins on a press. This production job takes twelve employees, six machine operators, one helper, four assemblers and one inspector.

Daily output in 9 hr. for press operators and 8 hr. for assemblers is approximately 600 chains, the making of which requires 36,000 to 38,000 stampings. Including the pins the number of pieces assembled is approximately 76,000.

One Operator Runs Two Machines

Much ingenuity is shown in lining up equipment to speed output and reduce labor. An illustration of this is found in a press line-up that permits one operator to run two machines. Two small presses with automatic roller feed, one belt driven from a line shaft and the other motor operated, are set close together at right angles and a flat wooden bar is attached to the operating treadle of each press. With her foot on the center of the bar the girl operator controls both machines, starting and stopping the two together.

The stampings being made on these two presses are the two halves of a threaded ferrule. The stock, which is fed to the machine from reels, is soft cold-rolled strip 2 in. wide. On combination cutting-off and forming dies the blank is cut off and formed, the forming including bending the piece into a semi-circle and pressing in the thread, which extends the length of the stamping. As the two halves are not exact duplicates, one is distinguished from the other by being stenciled during the press operation. The stampings are made at the rate of approximately 4000 pieces an hour by the one girl operator on two machines.

MOVING machines to the work is a policy successfully practiced by the Acklin Stamping Co. How stamping presses are shifted so that they can most effectively work in conjunction with others on given production jobs is described in this article. The smaller presses, up to 4 tons in weight, are picked up bodily and set where wanted. Flexibility in operation, lowered handling costs, fewer helpers needed and speeding up of production are advantages obtained.



Life of Cold-Heading Die Depends on Five Factors

MAXIMUM production of a cold-heading die depends on five main factors, namely, die steel, die design, die heat treatment, bolt material and machine operation, stated A. S. Jameson, metallurgist, West Pullman works, International Harvester Co., Chicago, in a paper on "Cold Heading Die Life," which was presented at the recent meeting of the American Society for Steel Treating at the Hotel Stevens, Chicago. Mr. Jameson recited the results of an investigation, the object of which was to obtain the maximum production from a die used to cold-form or cold-head a plow bolt, which is employed extensively in the farm equipment industry.

Four Steels Investigated

Four steels, designated as A, B, C and D, were selected for the investigation. Steel A was the product of an open-hearth furnace, steel B of a crucible furnace, and steel C a higher carbon melt from a crucible furnace. All four steels were plain carbon, but the composition of steel D was of special interest, for it had a higher manganese content than is usually found in carbon tool steels for cold-heading work.

In this connection Mr. Jameson pointed out that

current metallurgical opinion is not in favor of using a manganese content higher than 0.30 per cent in high-carbon steel dies for cold heading. A chromium content of 0.10 per cent in steel D approached the range where chromium will modify the hardening properties of carbon tool steels. The steels were obtained from the mills in 3 $\frac{5}{8}$ -in. round bars in an annealed condition. The composition of the steels is given in Table I.

The bars were inspected by deep etching, microscopic examination and hardness tests. Characteristics of the materials were further determined by quenching tests, carried out on 1-in. rounds machined from the bars, and later by McQuaid-Ehn carburizing tests. Bars were heat treated by being placed in an electric furnace at a temperature of 1200 deg. F., and after equalization were heated at a rate of 5 deg. per min. to the desired quenching temperatures, which occurred between 1510 and 1525 deg. for the lower heat and between 1610 and 1625 deg. for the higher. The rounds then were quenched in a 4 per cent brine solution, the temperature of which was from 40 to 45 deg.

Quenched bars were nicked on a flexible grinding wheel and broken for observation of the fractures. Cross-sections were cut through the quenched rounds in order to measure the depth of the hard case. The depth was read off in 1/64 in. on the polished and etched cross-section, the depth of the case being considered as equal to the extent of the martensitic structure. These measurements were supplemented by hardness readings.

Surface hardness of the 1-in. rounds was in accordance with

Table I—Chemical Composition of the Steels in Per Cent

Steel	Carbon	Manganese	Sulphur	Phosphorus	Silicon	Chromium
A	0.96	0.28	0.014	0.020	0.22	0.03
B	0.96	0.28	0.021	0.013	0.20	0.07
C	1.10	0.30	0.012	0.014	0.15	0.05
D	1.00	0.45	0.012	0.024	0.22	0.12

Table II—The Effect of Steel and Heat Treatment on Production

Heat Treatment	Steel A	Steel B	Steel C	Steel D
Quenched from 125 deg. Fahr. above hump, held 20 min.	11,100	10,500	10,400	32,200
Quenched from 125 deg. Fahr. above hump, held 60 min.	.....	.....	20,100	40,800
Quenched from 225 deg. Fahr. above hump, held 20 min.	22,200	20,500	30,000	27,300

NOTE: The figures give the average blank production on ends of the dies.

previous findings, a slight falling off in hardness being noticed when the temperature was increased to approximately 1600 deg. F. The higher carbon steel C showed soft spots at the lower quenching temperature and short hold time, emphasizing that a steel of this type should be held a considerable time at heat if a low quenching temperature is used. Measurements of the case depth of the hardened rounds indicated that an increase in the temperature produced an increase in case depth, as did an increased holding time.

Design of Die Depends on Shape of Bolt

Die design is governed primarily by the shape of the die bolt, said Mr. Jameson, but there are certain modifications that are resorted to in order to improve the die life. For example, it was discovered that the forming of a small radius in the corner of the die more than doubled the die life. A considerable increase in die life was also secured by rounding off the edge of that part of the die which forms the shoulder on the shank of the blank. When this edge was sharp, it filed off the surface of the bolt wire, the chips lodging in the corners of the head of the blank, thereby causing rapid deterioration of the die.

The dies were heat treated in a manner similar to the 1-in. rounds by the hump method. Two quenching temperatures and two quenching times were used. Experiments showed that by reason of the increased mass of a die, compared with that of a 1-in. round, the rate of heating to the quenching temperature must be considerably modified. Moreover, it is important that dies be heated in a uniform manner to the quenching temperature. It generally is necessary to obtain the proper rate of heating for each individual die shape.

In the quenching process the dies were withdrawn from the quenching fixture while still warm. Said Mr. Jameson, "This precaution is usually taken by tool hardeners and we have always found it to be a commendable practice. Many failures of tools, both after hardening and during service, will result from cracks developed by cooling completely. We find it desirable to temper the dies as soon as possible after withdrawal from the quenching medium. It is of considerable importance to know within close limits what size changes take place during heat treatment."

Overwhelming Factors Are the Wire and Machine Operation

Mr. Jameson declared that "as important as is the correct choice of the steel and the careful heat treatment of the dies, the most overwhelming factors are the wire and the machine operation. Unless these variables can be controlled within close limits the most careful heat-treated dies, made from the highest quality steels, will break down in a comparatively short time. These factors are the cause of the most misleading conclusions as to the best steel for heat treatment in a given case.

"The size of the wire in relation to the size of the hole in the die is the first wire consideration. The analysis of the wire has a considerable effect on the die life. Pure iron flows more

THE object of the author's investigation, described in this article, was to obtain the maximum die life from a certain type of cold-headed bolt die.

Maximum production depends on five factors: Die steel, die design, die heat treatment, bolt material and machine operation. The important part played by the depth of the case is emphasized.

easily and hardens less on cold working and consequently would be an ideal material in this respect. An increasing carbon content, because of the effect of carbon on the flow and the hardness after cold working, materially decreases the die life. The wire used in the experimental dies was of the following analysis: Carbon 0.30 — 0.37 per cent, manganese 0.50 — 0.80 per cent, sulphur 0.050 per cent (maximum), phosphorus 0.045 per cent (maximum).

"Manganese up to 1.25 per cent at least does not affect the die life when the carbon is under 0.20 per cent. Very successful die runs were obtained when using a wire of the analysis: Carbon 0.14 — 0.19 per cent, manganese 0.70 — 1.00 per cent. The physical properties of the wire in tension, especially the figure for the reduction of area, cause a material lengthening or shortening of the die life. A high reduction of area value is very desirable because it guarantees a rapid flow of metal without rupture. A reduction of area value of no less than 40 per cent is preferred."

Surface hardness of the wire is of some importance, stated Mr. Jameson. A variation in hardness within a short length of wire is detrimental, for if

(Continued on page 1436)



Fig. 1—Plow bolt and the sequence of manufacturing operations. Left to right: Wire length, first upset, blank, trimmed blank, and finished bolt

Economies Result from Welded-On Overlays and Heat Treatment

PROCEDURE and results of a series of investigations, extending over eight years, are given in this article. Ascertaining the value of welded-on overlays as a surface preparation for machine and other parts was the object. By properly combining welded-on overlays and heat treatments, it is possible to sponsor greater economies in machine and machinery construction and fabrication as well as considerably diminish the obsolescence of machine parts.

A PROPER combination of welded-on overlays and heat treatment makes possible substantial economies in machinery construction and fabrication, as well as a considerable decrease in the obsolescence of machine and machinery unit parts, stated Miles Catlin

Smith, manager of sales promotion, Stoodly Co., Whittier, Cal., in a paper dealing with the "Relationship Between Welded-On Overlays and Heat Treatment." This paper was presented at the recent meeting in Chicago of the American Society for Steel Treating.

Overlays Deposited by Two Welding Processes

Mr. Smith said that, strictly speaking, a welded-on overlay is any metallic layer of overlay that has been deposited in place by either of the two autogenous fusion welding processes, but in every-day practice it has come to mean an overlay of metallic alloy quite different in character from the metal overlaid.

Welded-on overlays make it possible to secure almost any desired surface at almost any desired point or over almost any desired area, provided the area overlaid is of a metal which will respond to the autogenous fusion welding process. At the present time the need seems to be for

an overlay which will protect or reinforce cast iron, wrought iron or steel. In most instances the overlay is utilized with either carbon, steel or any one of the more prevalent alloy steels.

To list all of the metallic alloys and elements which have proved to be in some measure adaptable to

welded-on overlay compounds would be an almost endless task. Tungsten and tungsten carbides have proved useful in producing hardness, but alloys incorporating tungsten have other characteristics which are not at all times desirable in a welded-on overlay for more or less general adoption. Likewise, silicon contributes to hardness, and a recognizable proportion of silicon in a ferrous alloy will produce a hard

overlay. Yet such an overlay may have a tendency toward surface checking and brittleness that will be quite undesirable. Chromium comes under much the same classification as silicon.

From the experience gained in the development so far, it has been conclusively proved that a more or less complex alloy of iron, silicon, carbon, chromium and one or two other metallic elements, in such proportionate quantities that each will contribute its maximum in strength, yet very little, if any, of its weaknesses will form the best welded-on

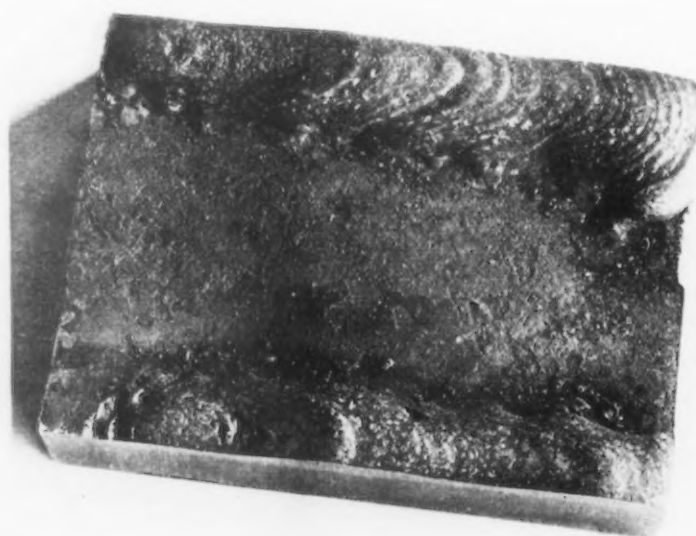


Fig. 1—Block of soft steel upon which has been welded two rows of overlay beads. The soft steel and overlay have been fractured and rough-ground along the center line of each overlay deposit. This overlay has a hardness, after being welded on, of from 56 to 58 Rockwell C. The overlay was made with the electric welding arc and this view shows the comparatively smooth surface of the overlay as it is deposited

overlay for general resistance to abrasive wear.

One interesting sidelight on a particular type of welded-on overlay is the fact that the materials marketed are in the form of a fabricated welding rod. That is, they consist of a soft steel sheath in which is held, unsmelted, a mixture of alloys and metallic and non-metallic elements as well as chemical reactory compounds. With such a rod it is possible during the welding procedure to produce chemical reactions, in some respects similar to the thermit process of forming a weld.

Welding rods utilized as welded-on overlays have relatively higher melting points and melt down less readily than soft steel welding rods. With the electric welding arc, the overlay rod should be used as a positive electrode and with the oxyacetylene torch, the frame should be free from uncombined oxygen and must be played alternately upon the rod and the metal overlaid. Simplicity of application is the keynote of welded-on overlays.

Overlay Should Be Only a Veneer

In every application, the overlay should be only a veneer. The most commonly used welded-on overlays are applied to a thickness of from 1/8 to 3/16 in. at their thinnest point, that is, if the overlay is to be ground to smoothness, the finished thickness should be no less than 1/8 in. and no more than 3/16 in. As it is applied, the overlay should consist of a continuous layer of overlapping welding beads.

Necessity of complete amalgamation between the metal overlaid and the overlay is quite apparent. The true overlay is the one which is abrasive resistant, if necessary corrosive resistant, not exceptionally hard nor exceedingly brittle, and one which will actually unite with the metal to which it is applied, so that it will remain in place

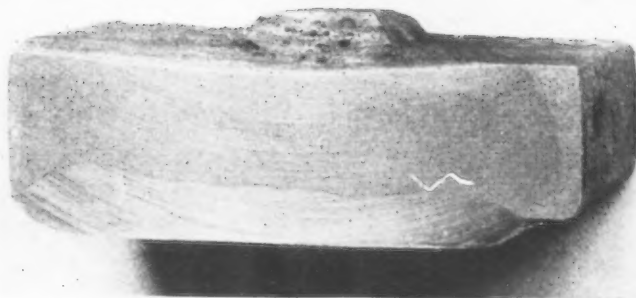


Fig. 3—On one side of this specimen an overlay of marketable welding alloy was deposited and on the other side an attempt was made to overlay with an alloy not properly compounded for the purpose. The piece was then fractured through the center. The difference in the two deposits is evident. The overlay of marketable alloy shows a grain quite similar in appearance to a fine grade of tool steel while the other deposit is full of holes and far from satisfactory

or more deg. Fahr., and, in the ordinary autogenous fusion welding operation, the heated mass is fully exposed to the action of atmospheric agencies. This fact automatically eliminates many metallic elements from consideration as welded-on overlay materials. Either they would be too greatly affected by atmospheric agencies or they would volatilize under the influence of so much heat. Of late, most successful experiments have been made along the lines of welding in a hydrogen atmosphere, but the present-day cost of such a procedure prohibits it from general use.

Determining the proper elements and the proper proportioning of each element for an alloy to be utilized as a welded-on overlay entails the necessity of determining beforehand exactly what the alloy will be after it has been exposed to a temperature of from 3500 to 6000 deg. Fahr. under varying atmospheric conditions and with the operation under the control of one who is not versed in metallurgy, perhaps only partially skilled as a welder.

Two Types of Heat Treatment

Heat treatment may be divided into two distinct divisions. One division includes those processes which have a tendency to harden the surface and the other includes those processes which are designed to produce structural strength throughout the entire part being treated. Experience has proved that welded-on over-
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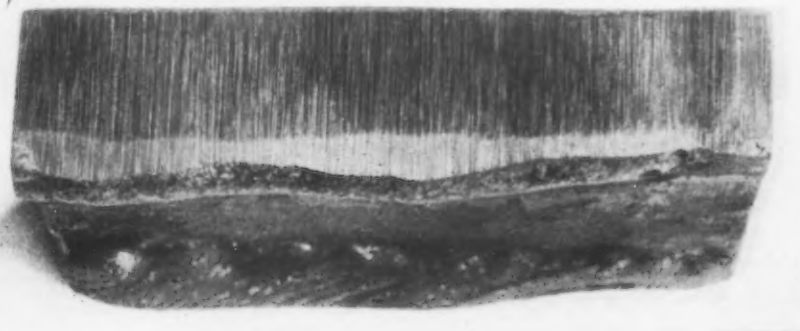


Fig. 2—View of rough-ground section of overlay shown in Fig. 1. The overlay is easily distinguishable and the uneven boundary line between the overlay and the soft steel is the line of amalgamation between the two. It is evident that the overlay has been completely fused with the metal overlaid

throughout its useful life. The overlay material must, as well, lend to ease of application with either the electric welding arc or the oxyacetylene torch, or both. Furthermore, the metal overlaid must not be damaged or weakened in the process.

Another phase of welded-on overlay utilization, which is often overlooked, is the fact that either the electric welding arc or the oxyacetylene flame generate a heat of some 6000



Showing the portable bench-type comparator arranged for inspecting screw threads. The operation is so simple, that a girl can pass or reject work with certainty and dispatch ▲▲▲

Optical Measuring Instruments as Practical Shop Tools

By J. W. MARSHALL

THE art of measuring has in recent years passed through a period of rapid development, brought about by the need for accurate and efficient means for checking interchangeable machine parts. Chief among the developments are gages of the optical type as contrasted with those of the purely mechanical type. Fundamentally, both of these types are alike controlled by master gages and, as interchangeable manufacturing is concerned principally with the use of working and inspection gages, it is to the development of the latter that one must look for the most noteworthy of present-day achievements as viewed from the practical aspect.

Now, the operation of gaging with any working or inspection gage is essentially that of comparing a dimension or dimensions of the product, either directly or indirectly, with those of the master gage. In this operation human and mechanical errors are encountered and, consequently, any reduction in them is a step in the right direction.

In the optical system, these causes for error have been entirely eliminated, and in addition, the errors are shown directly to the eye with many magnifications.

How the Comparator Operates

Among such optical measuring instruments is the comparator, which has seen sufficient service to warrant the conclusion that it is right in principle. It is essentially an inspection machine for measuring parts that must be accurately gaged by comparing the shadows, projected on a translucent screen or chart, of a correct master and of the part to be measured.

The Hartness comparator, built by the Jones & Lamson Machine Co., Springfield, Vt., consists essentially of a source of parallel light, a projection lens system, a device for holding the work in position in front of the projection lenses, and the chart or screen upon which the shadows are projected. This chart has on it two outlines of the correct form of the work to be inspected at the magnification used, one being spaced above the other at a distance equal to the tolerance multiplied by the magnification. The chart and master are adjusted till the outline on the chart coincides with the shadow of the gage, when the latter is removed and the work to be tested inserted, and its shadow compared with the outline on the chart.

In addition to giving a rapid indication of whether

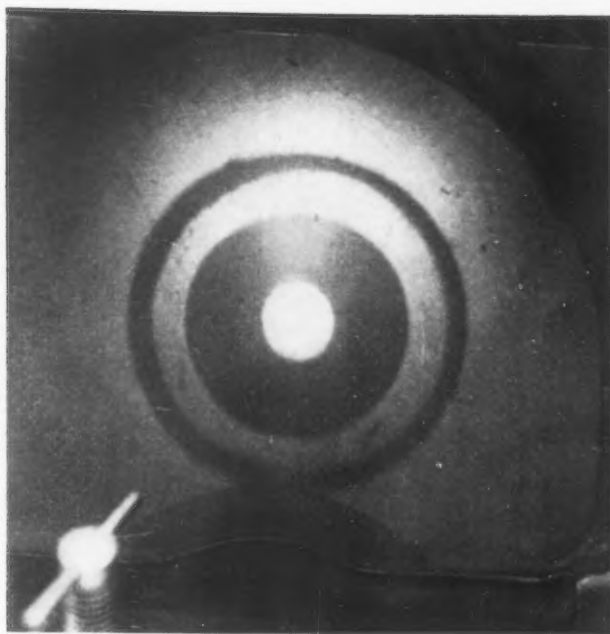


THIS and the photograph at the top of opposite page show a jewel that forms the bearing of a 0.020-in. Swiss-watch pinion before and after magnification on a Hartness comparator, which was used for inspecting the concentricity of the hole.

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ADVANTAGES derived from using an optical comparator as contrasted with mechanical gages in measuring screws, poppet valves, dental burrs and many complicated products are discussed in this article. Speed in operation and accuracy are among these. The comparator and how it works is fully described.

▼ ▼ ▼



the elements of the work lie within the limiting dimensions specified, the comparator has the advantage of furnishing more detailed information as to the errors in the work than is usually obtained by means of mechanical gages. Particularly, it furnishes more information as to irregularities of form.

Magnifications of the work range from 6 to 200, according to the lens system employed. The block lines on the chart serve as an optical aid to the eye in matching the projected shadow with the master outline. The source of light is an incandescent electric lamp so mounted that, by a set of condensing lenses, practically parallel light is secured, this light being lined up at all times with the optical axis of the projecting lens system. The objective lenses magnify and invert the image of the work while the ocular lenses remagnify and reinvert the image. The comparators are either of the bench or floor type. The bench type is especially suited for inspection of small work, such as screws; the larger machine for inspection of larger work, such as gears.

An object being measured is placed in a properly designed staging device. A ray of light from an ordinary automobile bulb is shot across the object and through a microscope, and the shadow thus cast is thrown on a

mirror at the back end of the comparator and thence reflected back to the chart directly in front of the operator's eyes. On the chart, readings may be taken to 0.0001 in. with the naked eye, the image being many times magnified.

Screw Threads Can Be Tested

As described, the machine is especially suitable for the testing of screw threads for, in this case, all that is required to pass inspection is that the shadow of the thread tested fall between the upper and lower outlines on the chart.

The chart consists of an outline of a perfect thread of maximum pitch diameter, with parallel lines indicating a thread of minimum pitch diameter. The space between these parallel lines is the tolerance which may vary according to the class of fit required. If the shadow of the thread is displaced laterally, lead error is shown; if it is displaced vertically, a variation in pitch diameter is the cause.

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SHOWING the contact of three teeth of a pair of gears, using a low-power lens system giving 30 to 40 magnifications. When properly staged, the gears are rotated and concentricity of pitch line, rolling action, etc., are studied. The examination may be made between two commercial gears or between one commercial and one master gear.





Gas Mixtures for Multi-Fuel-Fired Furnaces

By JOSEPH F. SHADGEN

Engineer, Smoot Engineering Co., New York

MOST modern steel plants are large, highly integrated centers of manufacture. The main divisions include coke plant, blast furnaces, open-hearth plant, rolling mills and finishing departments.

These huge modern plants need fuel as a vital raw material; in fact, all plants are geographically located for cheap fuel supply. The glory of Pittsburgh has its foundation in the natural gas and oil wells of Pennsylvania and the rich coal seams that crop out on the hillsides of the valleys along the Allegheny and the Monongahela.

The major metallurgical fuels are in gaseous form. Only the blast furnace is tied to solid fuel in the form of coke, charcoal or anthracite. Blast furnace gas, coke oven gas, producer gas, natural gas are the combustible gases available, with oils, tars and pitches, semi-gaseous (atomized) fuels also to be considered. Blast furnace gas was given some attention in an article in *THE IRON AGE* of Nov. 6, page 1287.

Certain Gases Independent of Demand

Our supply of blast furnace gas and coke oven gas is not controlled by the demand; their production depends on the operation of the blast furnaces and the coke ovens. These furnaces are large, and run at an even rate, very steadily. The supply of blast furnace gas is interrupted only by "sickness" or casting periods. The production of coke oven gas is more uniform yet, as the individual ovens are clustered into batteries of 15 to 45 units. Storage of these gases in holders has been found to be impractical (in many plants).

Natural gas was the ideal fuel of the "good old days" that has grown scarce during the past 15 years. Lately the enormous gas pockets in the Texas and Oklahoma oil fields bring to this fuel new importance.

Producer gas is made on the spot, as needed by the furnaces. Coal, steam and air are the needed raw products and the B.t.u. remain stored in the form of the highly concentrated coal until the demand arises.

Liquid fuels are always stored raw and atomized as needed; the flexibility of their supply is an important feature.

Producer Gas and Oil for Peak Demands

The nature of the supply of these fuels makes it advisable to use blast furnace gas and coke oven gas for all operations that have base-load characteristics, while producer gas and oil are best suited for peak-load demand. This consideration has been grossly neglected so far, on account of the lack of coordination and perspective between departments.

A comparison of the prices of these five groups of fuels is given in Table I, which shows the narrow range of values.

Until recently all these fuels have been used "as is" alone, and engineers have tried to find applications best fitted to their value and flame characters. Furnace designs were very conservative; there is the old story about "brick drawings" perpetuating old experience as well as old mistakes. Lately the economic pressure has changed this conservative attitude. Under the leadership of far-sighted management, engineers of the Bethlehem Steel Corporation undertook some pioneer work with regard to gas mixing.

Successful mixing devices today in operation handle all these gases available—producer gas, blast furnace gas and coke oven gas. The range and ratio problem have been solved by adequate design of the mixing apparatus. (See article in Jan. 16, 1930, issue of *THE IRON AGE*.)

Blast furnace gas is mixed with coke oven gas to create varying mixtures having from 150 to 230 B.t.u. per cu. ft. This means 6 volumes of blast furnace gas to 1 volume of coke oven gas, or 2 volumes of blast furnace gas to 1 volume of coke oven gas, for the two B.t.u. figures given. The ratio of mixture is determined by the "pyrometric" character of the fuel, best suited to the efficiency of the furnace. Soaking pits, tempering ovens, plate furnaces, annealing operations are now economically handled with these mixtures, in simple furnaces adapted to these new fuels.

Table I—Values of Five Leading Metallurgical Fuels

Unit	Blast Furnace Gas cu. ft.	Producer Gas cu. ft.	Coke Oven Gas cu. ft.	Natural Gas cu. ft.	Oil gal.
B.t.u. per unit	90	145	500	1,000	150,000
Value per unit*	2 to 3c.	3 to 5c.	10 to 20c.	15 to 30c.	2.5 to 5c.
Units per million B.t.u.	11,000	7,150	2,000	1,000	6.7
Value per million B.t.u.	22 to 33c.	22 to 36c.	20 to 40	15 to 30c.	16 to 32c.

*1000 units, for the four gases.

Coke oven gas has enriched producer gas, and a mixture of coke oven gas and blast furnace gas (175 B.t.u.) has been added to producer gas to burn in open-hearth furnaces, thus eliminating one-third to one-half of the producers.

Blast furnace gas has leaned out natural gas and created mixtures of B.t.u. content comparable to coke oven gas. One volume of blast furnace gas and 1 volume of natural gas produce a mixture of 545 B.t.u., with a different flame character from coke oven gas, on account of the different ratio of coke oven, and shows the following comparison:

	CO ₂	CO	CH ₄	H ₂	N ₂	B.t.u. per Cu. Ft.
Coke oven gas..	0.75	6.00	28.00	53.00	12.00	478
Mixture	6.36	12.93	46.63	2.65	31.33	525

These mixtures were made in the pipe lines leading to the furnaces. One apparatus serves a battery of furnaces and, if gas pressures are maintained at the same time, burners can be set for definite results. This makes for simplicity of installation and serves well many applications.

Different Methods of Burning Gases

An alternate solution is offered when two or more fuels are carried independently to a large furnace and burned jointly and simultaneously. This method demands that multi-fuel-fired furnaces be equipped with apparatus to regulate the air for all fuels, in addition to the proper draft control for removal of waste gases.

This development is also a sturdy youngster, full of promise. At Wisconsin Steel Works, South Chicago, Ill., and in Hamilton, Canada (Steel Co. of Canada), early attempts were made successfully. Today over 25 open-hearth furnaces operate on more than one fuel. The combinations are coke oven gas and oil; coke oven gas and tar; blast furnace gas and coke oven gas; blast furnace gas, coke oven gas and

producer gas; and blast furnace gas, coke oven gas, producer gas and oil (tar).

Blast furnace gas alone is not suitable for open-hearth operation on account of the low flame temperature, but, enriched with coke oven gas (3 volumes of blast furnace gas plus 1 volume of coke oven gas to produce 195 B.t.u. mixture), good results have been secured. The art has not progressed sufficiently, as furnace design has to be adapted to the fuel features. But it already can be safely said that the economies realized pay amply for the expenditures.

Either gas mixing or multi-fuel-fired furnaces offer a means to utilize large quantities of blast furnace gas in open-hearth furnaces. Here is the largest fuel consumer (4,000,000 to 4,500,000 B.t.u. per ton) available.

Open-Hearth Can Use Only Part of the Gas

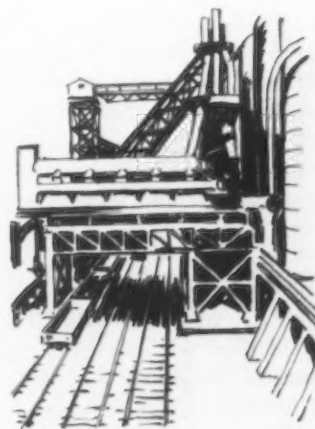
As the surplus blast furnace gas per ton of pig iron is roughly 95,000 to 100,000 cu. ft., and as this permits the production of 90,000 cu. ft. of blast furnace gas plus 30,000 cu. ft. of coke oven gas = 120,000 cu. ft. of gas mixture, at 195 B.t.u., or some 24,000,000 B.t.u., aggregate, we have enough to refine 5 or 6 tons of steel.

As 1 ton of pig iron produces, with scrap and ore, a maximum of 3 tons of steel, and usually about 2 tons, it appears that open-hearth furnaces cannot possibly absorb all the surplus blast furnace gas, but a big chunk can be disposed of as metallurgical fuel to great advantage. The remainder can be used in soaking pits and reheating furnaces, either alone or jointly with other fuels.

Boilers are used as "flywheels" for burning all gaseous fuels over week-end periods, shutdown days of departments, peak-load hours, etc. Boiler plants

(Concluded on page 1436)

MIXING available gases to produce a metallurgical fuel of desired characteristics is a subject which has engrossed the attention of many fuel engineers during the past two years. This article surveys the field with regard to the principal available fuels, and shows how they may be mixed for various purposes and how, finally, a gas mixture of any desired heating value, but with different characteristics otherwise, may be obtained by proper blending of two or more commonly obtainable gases.





Welding of Rustless Steels Is Making Progress

THAT progress is being made in the welding of straight chromium iron and austenitic "18-8" alloy was reflected in the discussions at the fall meeting of the American Welding Society held at the Congress Hotel, Chicago.

Success Depends on Design of Welded Part

Success of this welding technique, however, seems to depend largely on the design of the part to be welded. Spot welding is being done on a commercial basis; in other fields progress has also been rapid, especially considering the comparatively recent development of the alloys themselves.

L. W. Hostettler, engineer, Allegheny Steel Co., Brackenridge, Pa., in an extemporaneous address at one of the sessions discussed some of the physical and electrical properties which complicate the problem. The extremely high coefficient of expansion, low thermal coefficient, higher electrical resistance and other characteristics of the "18-8" alloy were shown to call for a very careful welding technique and the use of suitable fluxes, particularly those containing no carbonaceous compounds. It is difficult to treat of the welding technique apart from specific applications, he said. Many failures are due to the design of the piece to be welded, which design might be such as to build up local work strains and other unfavorable conditions. For this reason, the Allegheny Steel Co. maintains a research department for consultation in new applications of welding.

Straight chrome irons may be either arc, gas, spot or compression butt-welded. With oxy-acetylene, it is necessary to use a flame that is slightly reducing, Mr. Hostettler said. In this the welder must have the best kind of equipment to control the gas and air, otherwise excessive carbon will be built up in the weld, causing embrittlement and lessening the corrosion resistance.

Preheating Is Sometimes Advantageous

The electric arc was favored for welding the "18-8" alloy, except on No. 14 and lighter gage sheets, for which the gas welding is more practical. A short or medium arc was said to make a sounder weld than a long arc.

For some pieces, preheating has advantages. It serves to offset the high expansion from the heat of the welding process. Annealing after welding was recommended, although, in the case of the "18-8" alloy, it is not necessary in all cases. Two methods are available. In one, the most used for the straight chrome irons, the material is heated to 1425 deg. Fahr. and then air-cooled. In the other, the material is heated above its critical temperature of about 1500 deg. Fahr. and then tempered.

In discussing this, Mr. Hostettler emphasized the fact that the "18-8" alloy is austenitic, outlined the change-over or throwing out of solution of some of the carbide that occurs adjacent to the weld. When the alloy is subjected to temperatures ranging from about 1000 to 1550 deg. Fahr., annealing after welding was recommended; the metal may be put back into its true austenitic condition by annealing at a minimum of 1800 deg. Fahr., and cooling rapidly in air or water, depending upon the cross-section. For grinding the weld, a special free-cutting soft wheel is desirable in order to prevent buckling from excessive heat built up by the wrong type of wheel.

Need of Annealing Depends on Use of Part

The necessity for annealing the "18-8" alloy after welding, machining or cold working was said to depend entirely upon the use to which the finished part or product is to be put. Apparatus for use in connection with hot sulphite liquor or for such active electrolytes as nitric acid, for example, must be annealed.

It was pointed out that, due to the high coefficient of expansion, a great deal of skill is required to weld a long section of light gage "18-8" alloy sheet and not have it buckle. For this arc welding is preferred because it is quicker, and confines the heat to a much smaller area of the sheet.

When welding by oxy-acetylene, jigs and chill plates are at times necessary to keep the piece being welded from running out of shape. A coated rod is necessary with the arc process, but not with gas welding. Rods having an excess of chromium and a minimum of carbon are preferable, the higher chromium to replace "evaporative" losses in the metal adjoining the weld. The flux should be such as not to add carbon.

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INCREASED use of the rustless steels has necessitated a study of proper welding conditions. This article brings together some valuable data, based on the recent experience of an engineer of a prominent company producing these materials.

Success depends largely on the design of the part to be welded. Straight chrome-irons can be welded by any one of four methods. Annealing of welds is important in some cases. Material of very light gage can be welded only by electric roll or spot weld methods. Experience of the Ford Motor Co. is given.

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Welding of material of too light a gage is to be avoided, it was said, except by electric roll or spot weld methods. In discussing the brazing of "18-8" alloys, Mr. Hostettler stated that he had never seen it done successfully on a production basis. Very little vertical or overhead arc welding of these alloys has been done; in this, a great deal depends upon the flux and the operator.

Practice of the Ford Company

In this discussion, H. Chase, McGraw-Hill Publishing Co., told of the practice of the Ford company in electric compression butt-welding 9-in. diameter stainless steel headlight rims of only 0.025-in. thickness. Both stainless iron and the "18-8" alloy have been used. At first, after each run of 200 or 300 rings, difficulties were experienced. One source of difficulty

was that metal strip was not uniform in thickness from the edges to the center. After considerable experimenting with current, time of welding, pressure, dies, etc., steel dies ground on the surface were adopted. Today in the daily production of 15,000 rings, there are only 10 or 12 rejects.

After welding, the flash is ground off and the welded rings are placed in a die, expanded and formed into the finished rims, then ground, polished and buffed. In the case of the "18-8" alloy, no annealing is necessary after welding as, with proper technique, this austenitic "18-8" alloy does not become embrittled in or adjacent to the weld, as is the case with the straight chrome "stainless" alloy, which is martensitic in structure and air hardens above its critical temperature, thereby reducing its ductility value in the area heated above its critical temperature.

Fire, Load and Sound Tests of Battledeck Floor

FIRE tests of the battledeck floor is the subject of a comprehensive and extensive program now being carried on for the American Institute of Steel Construction by the Bureau of Standards at Washington, to determine the fire resistance of this new type of welded steel floor construction. Fire exposure will be applied to the floors from below in twelve of the test series, but in six tests fire exposure from above will be applied by burning combustible materials, such as wood and paper in amounts from 10 lb. to 40 lb. per sq. ft. of floor area. Various degrees of protection will be given the upper surfaces of the steel plate floor for these tests, from the bare plate to a series of five types of floor coverings.

The test floors will be 18 ft. long and 13½ ft. wide. The beams will span the full 18-ft. length of the floor except in five tests where the beams will be supported on a girder at an intermediate point to introduce the details of fireproofing required for the girder.

Arrangements have been completed for a series of load tests, also to be carried out by the Bureau of Standards, under the supervision of the engineering mechanics section of the Bureau. These tests will consist of strain gage measurements on one panel, which

will be placed in the restraining frame used in carrying out the fire tests. One load test will develop the location of the neutral axis of the tee beam section. Determination will also be made of the intensity of stress in the upper surface of the plate between beams—a gage length of 10 in. being used. About five gage lines parallel to the axis of the beams will be uniformly spaced between adjacent beams located as near the center of the panel as possible.

Determination of shearing stress on the welds will be made. The gage lines will be placed in the three middle plates of the panel as near one edge of the panel as practicable. The gage lengths used will be 2 in. and gage lines will be placed on the beam near the fillet joining the web to the upper flange and in the plates vertically above these gage lines. In this panel the yield point will be arrived at by increments of live loads, readings to be taken at increases of 40 lb. per sq. ft. to 80 lb., then at 20 lb. increments to the point of failure.

Arrangements have also been made with the sound laboratory of the Bureau of Standards to carry out a series of six tests on battledeck floor panels, each with a variation in ceiling protection and floor covering.

Internal Stresses in Hollow Cylinders of Tool Steel Estimated

DEVELOPMENT of a method for estimating the internal stress in quenched hollow carbon steel cylinders and its application to two distinct types of quenching were discussed by O. V. Greene, Carpenter Steel Co., Reading, Pa., in a paper entitled "Estimation of Internal Stress in Quenched Hollow Cylinders of Carbon Tool Steel" at the recent annual meeting in Chicago of the American Society for Steel Treating. Hollow cylinders were chosen because they represent the ideal forms of drawing or cold heading device in which the most important stresses are tangential and radial rather than axial.

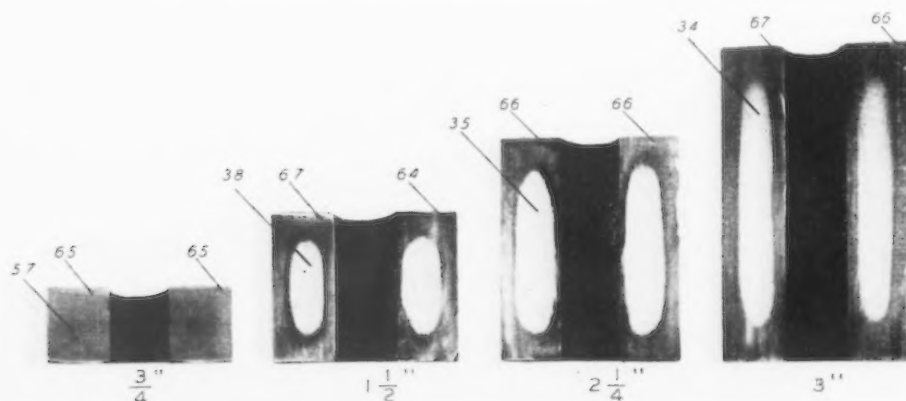
Submerged Flushing First Method Used

A number of cylinders, varying in length from $\frac{3}{4}$ in. to 3 in. and having a diameter of $1\frac{7}{8}$ in. with a $\frac{5}{8}$ -in. hole, were quenched by submerged flushing at

various temperatures. Certain specimens were subsequently tempered. The remainder of the specimens were flushed at the hole only. Quenching difficulties encountered in flushing the hole were overcome by using a simple quenching device.

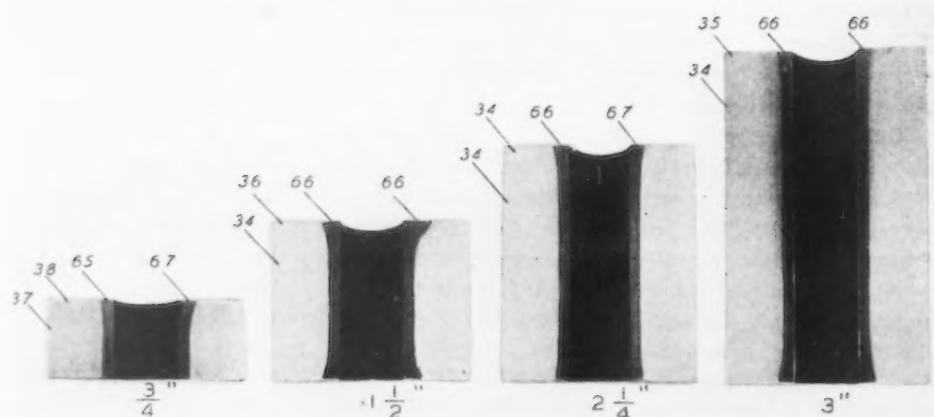
Two stainless steel disks, $\frac{3}{8}$ in. thick and 4 in. in diameter, were drilled. The bar holding the spreader was peened in the bottom disk. Asbestos washers were placed between the cylinders and disks, and the whole clamped by means of stainless steel bolts and nuts. The holes in the disks, corresponding to the holes in the cylinders, were tapered to admit the tapered nozzle of the flush at the top and to allow unrestricted flow at the bottom.

The disks and cylinders after assembly were placed in the furnace and heated to the required temperature. The quenching operation consequently was

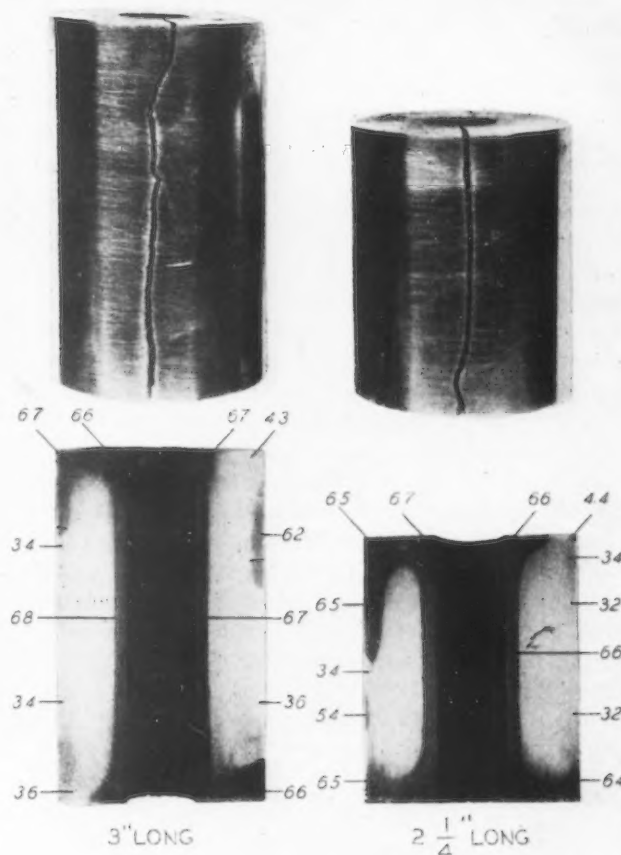


Cylinders quenched by submerged flushing at 1600 deg. Fahr. Rockwell C hardness numbers are as shown. Note cylinder, $\frac{3}{4}$ in. long, hardened through at this temperature. (below)

Cylinders quenched by flushing the hole at 1600 deg. Fahr. Rockwell C hardness at points shown. Note the uniform hardness penetration as compared with cylinders shown on opposite page.



THE author describes two widely different methods of determining internal stresses in hollow cylinders of carbon tool steel. The two methods are submerged flushing and flushing at the holes, when quenching. In the first case, the stresses at the holes of such cylinders are either tangential tension or tangential tension and compression combined. In the other case, the stresses are uniformly tangential compression. Relative advantages are pointed out.



Results of first attempts to flush the hole only. The cylinders failed by complete cracking when room temperature was reached. The lower half of the figure shows the nonuniform hardness penetration obtained and the Rockwell C hardness numbers. Flushed at hole 1600 deg. Fahr.

simple. The device containing the cylinder was removed from the furnace, the nozzle of the flush inserted and the water turned on. The fit between disks and cylinders prevented the flushing of the top or bottom surfaces. The alinement of cylinders with respect to the spreaders was always perfect.

The gradation in hardness from the hardened zone outward in cylinders flushed at the hole at 1600 deg. Fahr. was much less than in those flushed at 1450 deg. This is undoubtedly one reason, said Mr. Greene, why the hardened surfaces of dies that have been flushed at 1600 deg. do not tend to sink as readily as those in dies quenched at lower temperatures.

Mr. Greene found that, after submerged flushing both at 1450 and 1600 deg., all lengths of cylinders are bell-mouthed. That is, the middle of the hole decreased in size while the ends expanded. The distortion is greater at 1600 deg. than at 1450 deg. After tempering at 450 deg., the bell form persisted, but both the ends of the hole and the middle showed a considerable decrease in diameter.

Different Results When Flushing at the Hole

Flushing at the hole presented entirely different results. The holes were but slightly warped and both the ends and the middle showed a uniform decrease in diameter with all lengths at both 1450 and 1600 deg. At the former temperature the holes of the 3/4-in. and the 3-in. cylinders and at the latter temperature the holes of the 1 1/2-in. and 2 1/4-in. cylinders

actually had less decrease in diameter at the middle than at the ends. This caused a slight warping in a direction opposite to that of the cylinders quenched by submerged flushing. The cylinders flushed at 1600 deg. revealed a greater decrease in hole diameter than those flushed at 1450 deg. Tempering at 450 deg. further decreased the diameter of the holes.

Mr. Greene discovered that there was considerably more bending at the outside diameters of cylinders quenched by submerged flushing than those quenched at the hole. Tempering at 450 deg., however, reduced the bending after both methods of quenching at both temperatures. The changes in lengths of all specimens were greater at the hole, causing a distinct crowning at each end. These changes increased slightly with higher quenching temperatures with both methods of quenching. However, the changes in length after quenching by both methods at 1450 and 1600 deg. decreased with the increasing length of the cylinder. After tempering at 450 deg., the lengths of all cylinders decreased with the exception of the 3/4-in. and 1 1/2-in. cylinders flushed at the hole, and quenched by submerged flushing at 1450 deg. Both of these lengths, after tempering, showed substantial increases.

The author noted that cylinders, quenched by flushing at the hole, show a gain in tangential compression at the hole as the quenching temperature increases. The tangential tension at the hole of cylinders quenched by submerged flushing decreases

with higher quenching temperature, with the exception of the cylinder $\frac{3}{4}$ in. long which hardened through at 1600 deg. Tempering at 450 deg. reduces the magnitude of the stresses in all cylinders, irrespective of treatment or temperature.

"Super-Tools" Result from Quenching at the Hole

Stresses in cylinders quenched by being flushed at the hole, said Mr. Greene, are in the right direction to resist pressures at the hole. Such methods of quenching used for drawing dies, followed by a low temper for header dies, should result in super-tools. "Since the stresses in dies quenched at the hole have been employed to advantage, and the metal back of the hardened zone is soft and tough, there is no reason to reduce the stresses by tempering for certain types of applications. For header dies, however, it would probably be necessary to temper such a die in order to reduce the possibility of cracking or spalling and to allow reaming." If the quenching is adjusted so that the resultant stresses are beneficial, fewer tools will be lost during heat treatment, and substantial increases in performance will be realized.

Author's Results Summarized

Mr. Greene summarized the results of his work as follows:

1.—The axial compression in the outside surface of quenched solid bars decreases with increase of hardness penetration, but increases with quenching temperature, except in cases of complete hardening of the section.

2.—Portions of cylinders under martensitic layers formed by quenching at 1600 deg. Fahr. are considerably harder than those under layers formed by quenching at 1450 deg.

3.—The tangential compression at the holes of cylinders, quenched by flushing at the hole, increases with quenching temperature. The tangential tension in the center of the holes of cylinders, quenched by submerged flushing, decreases with increase of quenching temperature.

4.—The tangential compression at the holes of cylinders, quenched by flushing at the hole, decreases with increase of the length of the cylinders. The tangential tension at the center of holes of cylinders, quenched by submerged flushing, also decreases with increase of the length of the cylinders.

5.—Holes of cylinders quenched by flushing at the hole are uniformly in tangential compression even after tempering at 450 deg. Fahr. The holes of cylinders quenched by submerged flushing at 1450 deg. are in tangential tension at the center and in tangential compression at the ends. This condition persists after tempering at 450 deg. The holes of cylinders quenched by submerged flushing at 1600 deg. are uniformly in tangential tension. Tempering at 450 deg. after submerged flushing at 1600 deg. leaves the center of the holes in tension, but changes the stress at the ends to tangential compression.

6.—The axial stresses, when present at the holes of cylinders, are compressional. This stress increases with increase of length of cylinders, but never reaches values that are of consequence.

7.—A tabulation of the differences between the two methods of quenching employed is as follows:

Flushed at the Hole

Little or no warping.
Uniform tangential compression at the hole.

Stress in right direction to resist pressure at the hole.

May be used in untempered condition for some purposes; however, tempering as high as 450 deg. Fahr. leaves considerable tangential compression at the hole.

Intrinsic strength of steel at the hole not used to resist pressures in the hole.

The extreme hardness of quenched martensite may be retained in the hole for certain applications such as drawing dies.

Submerged Flushing

Considerable warping.
In some cases both tangential compression and tension are present in the hole; in others uniform tangential tension in the hole.

Stresses at center of hole in tension and therefore in wrong direction to resist pressures at the hole.

Must be tempered to relieve tensional stresses. Compressional stresses at the ends are also reduced. In all cases after tempering tangential tension remains in the centers of the holes.

Actual strength of the steel at the hole must be used to resist pressures in the hole.

Holes and backing are considerably softer due to the necessity of tempering.

Two Phenomena Cause Internal Stresses

In a written comment on Mr. Greene's paper, Howard Scott said that internal stresses as a result of quenching are caused by two phenomena. When a homogeneous material having no transformation in the temperature range involved is quenched, internal stresses are developed by temperature gradients acting in conjunction with thermal expansion and plasticity of the metal. Internal stresses developed in this manner might be more properly identified as residual stresses, because they are the outcome of stress variations occurring at high temperatures.

The other type of internal stress is caused by the non-homogeneity of structure. Its genesis may well be illustrated by steel which is austenitic at atmospheric temperature, but starts to transform into martensite at a slightly lower temperature. If a bulky piece of such steel is plunged in liquid air for a short time and brought back to atmospheric temperature quickly, a surface layer of martensite will have formed. As the specific volume of martensite is much greater than austenite, the surface will be under compressional stress of a high order. Internal stresses in superficially hardened steel are resultant of the two types of generating factors just described.

Shows How Elusive Stresses Can Be

Showing how elusive the behavior of stresses can be, H. G. Keshian, Chase Companies, Waterbury, Conn., described the experience of a company manufacturing forgings and using modern heat-treating methods. From alloy steel forgings it made hollow cylinders 33 in. in diameter and 35 in. long with bores varying from $6\frac{1}{2}$ to 8 in. in diameter. All of the cylinders were heat treated in oil by submerged flushing at the hole and then tempered at a temperature well above that sufficient to relieve unbalanced stresses. Almost all of these cylinders cracked open either in transit or soon after going into service where they were subjected to internal pressure of 80,000 lb. per sq. in. Hardness tests on a split section showed a tensile strength of 120,000 lb. per sq. in. near the bore and 160,000 lb. near the outside edge, with a corresponding yield point of 100,000 and 140,000 lb. The quenching stresses must have been immense to have snapped open a section of metal $13\frac{1}{2}$ in. thick and 35 in. long.

Tungsten Carbide—the First Product of a New Metallurgy



NEEDED for a thorough understanding of the composition and character of cemented tungsten carbide as a prerequisite to its intelligent application was emphasized by Gregory J. Comstock, Firth-Sterling Steel Co., McKeesport, Pa., in an illuminating address at one of the sessions of the recent National Metal Congress.

Two years of application have demonstrated that cemented tungsten carbide has an important place in industry. Much has been learned not only about proper applications, but also about the manufacture of the material itself. The immediate future of this hard alloy is the development of different grades to meet the individual requirements of its diversified application, according to Mr. Comstock, whose paper is presented in part in the paragraphs that follow.

History of Application Similar to That of High-Speed Steel

Two years of general and increasing application of cemented tungsten carbide to industry have conclusively demonstrated, but have not as yet entirely defined and evaluated, the commercial value of this product. Thus far, the history of its application has been similar to that of high-speed steel, which was one of high anticipation, alternating discouragement and encouragement, and finally of successful and wide-spread utilization. High-speed steel at its inception, however, had one decided advantage over this new material in that it was a product of a well recognized method of manufacture. The unavoidable mystery and misunderstanding which has shrouded the manufacture and composition of cemented tungsten carbide has undoubtedly militated against its successful use in a great many cases.

In its simplest form cemented tungsten carbide consists of minute irregular particles of tungsten carbide, which are believed to be harder and more stable than the carbides present in high-speed steel, cemented in a thin metal matrix. The tungsten-carbide particles constitute roughly from 85 to 97 per cent of the

metal aggregate. The carbides present in high-speed steel cannot exceed a third of the amount present in the carbide alloy according to the same rough generalization. Regarded in this light it will be seen that the carbide alloy may be considered as the cutting essence of high-speed steel. It is perhaps reasonable to wonder why its fabrication was not attempted several years ago.

Powder Metallurgy to Have Important Place

The original conception of a hard metal alloy composed largely of tungsten carbide was evolved in the electric lamp industry, where the necessity existed for wire dies capable of withstanding the hard usage imposed by the manufacture of metallic tungsten filaments. The highly refractory nature of tungsten, which precludes its satisfactory casting and working according to the methods commonly applied to metals of lower melting characteristics, familiarized the pioneers of the lamp industry with a type of metallurgy which was peculiarly their own. The processes of this industry are largely founded upon the physical laws which govern the fusion of finely pulverized metals and the metallurgy involved may quite fittingly be called "the metallurgy of powders." When extremely hard dies were required for the manufacture of filaments, therefore, the powder metallurgist was able to make quite satisfactory ones by the methods with which he was most familiar, i. e., the fusion at high temperatures of tungsten, carbon and cobalt or iron.

From this beginning has been evolved cemented tungsten carbide, which is today practically the only product of a metallurgy that has until recently been confined to the manufacture of one particular product only but now gives every indication of taking an important place in our manufacturing scheme. Emphasis should possibly be placed on the fact that powder metallurgy is at present in reality the metallurgy of powdered tungsten, or more recently, the metallurgy of powdered tungsten carbide. Its laws and processes are distinctly in the formative stage. Scientific interest and activity have been quickened, however, by the commercial possibilities presented by the alloys made possible by these new processes, and intensive investigations and study have now been going on for some time. It is safe to prophesy that the present

alloy we are discussing is but the forerunner of many other valuable products.

How Cemented Tungsten Carbide Is Made

The process for manufacture of cemented tungsten carbide alloys includes the preparation of extremely fine tungsten powders of high purity; the carburization of tungsten powders to produce tungsten carbide; the mechanical comminution of tungsten carbide with powdered cobalt; the compacting or pressing of these mixed powders to billet form; the first or pre-sintering heat treatment; shaping; and final sintering. Either tungstic acid (WO_3) or ammonium paratungstate $[(\text{NH}_4)_{10}\text{W}_{12}\text{O}_{41}\cdot 11\text{H}_2\text{O}]$ is prepared from carefully selected ores by the chemical processes commonly employed in the preparation of these compounds. When Sheelite is the ore used, the preliminary treatment consists of decomposition with a commercial acid. During this treatment the calcium goes into solution and crude tungstic acid remains as a sludge. The reaction may be represented by the equation: $\text{CaWO}_4 + 2\text{HCl} = \text{WO}_3 + \text{CaCl}_2 + \text{H}_2\text{O}$. The finely ground ore has been previously mixed with a small quantity of manganese dioxide which completely oxidizes any iron present during this reaction. The crude tungstic acid thus produced is first purified by reprecipitation, being dissolved by the addition of ammonium hydroxide and after filtering reprecipitated by the addition of hydrochloric acid. The purified salts of tungsten are next reduced to the metal in tube furnaces, which contain an atmosphere of hydrogen at a temperature carefully regulated to produce a minimum grain size. The result of this reduction is a fine metallic powder the grain size of which may vary between two and six μ and the purity of which is rigidly kept above 99.5 per cent.

The metallic tungsten is then carburized by any one of several well known methods, which consist either of passing the powder through a furnace containing a carbonaceous gas or by heating it under hydrogen when intimately mixed with pure and finely divided carbon. The result of the carburizing process is a finely divided powder consisting of tungsten carbide (WC), the hardness of each particle of which has been determined as being between that of the sapphire and the diamond.

This powder is then milled in a stainless steel ball mill with powdered cobalt, which being soft, coats each particle of tungsten carbide more or less thoroughly with a thin pellicle of that metal. The milled metals are then ready for compacting. This operation is performed in a steel die under hydraulic pressure. The powders are pressed into billets of suitable size and shape for the manufacture of tips for tools, dies for drawing wire, etc., etc. These billets are next heated in hydrogen to a temperature which gives them sufficient cohesion to prevent breakage during shaping to the desired conformation. This heating operation is designated as the first or pre-sintering treatment. In the presintered state the material resembles graphite both in appearance and workability and may be shaped with a file or even turned in a lathe without fear of spalling or breaking. The increase in strength which results from this heating to several hundred degrees below the melting point of cobalt is attributable to the fact that the impinging cobalt oxide films

are reduced during the treatment and thus lightly cement the powdered metals together. When shaped the pieces are final-sintered at a high, white heat, again in an atmosphere of hydrogen. During this treatment cementation takes place, a marked change in size is noted and the piece which has previously consisted of a high porous mass of fine granular particles shrinks to a dense material which is without voids that can be detected at a magnification of 100 diameters. Except for final grinding and perhaps lapping where a fine finish and sharp edges are desired the product is now ready for use.

Properties of Cemented Tungsten Carbide

There is at present no satisfactory method of accurately determining the hardness of cemented tungsten carbide. As has been pointed out, its abrasive hardness is the hardness of tungsten carbide, which has been calculated by German investigators to be 9.8 on Moh's scale. The use of the Rockwell tester for determining the hardness of cemented tungsten carbide has been suggested and has met with some general application. The resistance to indentation of the cemented carbide does not give the true hardness of the material, but is rather misleading as it measures in part the strength of the bond, together with a hardness of the cement and the carbide itself. In lieu of better methods of testing, however, the Rockwell hardness tester can be used.

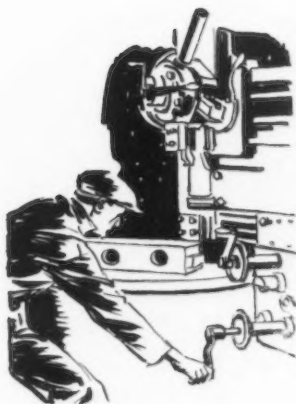
The heat conductivity of cemented tungsten carbide is approximately 0.21 in cm. gm. sec. The coefficient of expansion is 4.4×10^{-6} . The electrical conductivity is roughly 5 ohms per millimeter squared. The magnetic permeability has been determined as being 2. Cemented tungsten carbide may be expected to decompose at approximately 1600 deg. C. When subjected to cross-breaking stresses test pieces give a resistance of from 180,000 to 350,000 lb. per sq. in., depending upon the grade of the material which is being tested. The compressive strength of the material has been determined as being more than 500,000 lb. per sq. in.

Future Lies in Development of Grades to Suit Diversified Requirements

Several grades of cemented tungsten carbide are available for commercial use. These vary materially in hardness, as measured by indentation tests, and in toughness, as shown by transverse breaking tests. These variations in physical properties were at first produced only by changes in composition, but are more recently being brought about by varying the size of the carbide particle. Application of a variety of carbide alloys, to the commercial problems presented, represents the next step in the development of this new type of metal aggregate.

Increasing the amount of bonding cement results in a toughening of this material, but necessarily decreases the number of hard carbide particles present in a unit area of cutting edge or abrasion resisting surface. It may therefore be regarded as being one of the poorest ways of strengthening the product. More encouraging results have been ob-





THE history of the application of cemented tungsten carbide has been similar to that of high-speed steel: High anticipation, alternating discouragement and encouragement, and, finally, successful utilization, explains Mr. Comstock in his recent paper on cemented tungsten carbide, here abstracted.

But high-speed steel had one decided advantage: it was a product of a well-recognized method of manufacture. On the other hand, tungsten carbide, the first product of a new metallurgy, was shrouded in unavoidable mystery, which has militated in many cases against its successful use.

In the author's outline of the history, composition, characteristics and manufacture of this new material, considerable data that should make for more intelligent application are made available.

tained, however, by producing material, the carbide particles of which have been sized according to definite proportions. This method was suggested by the similar problem presented to those interested in producing stronger concrete and the development of a modulated stone size to obtain increased material strength. At least one grade of commercial cemented carbide is at present being manufactured according to this method. Investigations are in progress as to the possibility of further increasing the resistance of the material to transverse rupture by particle size regulation.

The introduction of small amounts of metals other than cobalt and the production of alloy binders presents a further possibility of the development of special grades of this material. Many such alloys have been studied and discarded as being undesirable, chiefly, it is believed, because the fundamental laws governing the tertiary alloys of tungsten, cobalt, and carbon have yet to be fully investigated. W. P. Sykes's

excellent work on the alloys of tungsten and carbon undoubtedly aid this phase of carbide development most materially.

One interesting and as yet unexplained fact noticed in the development of this material is that the tungsten which is produced from certain ores communicates most unusual and desirable properties of toughness combined with hardness to the finished product. The most carefully conducted analyses of the various tungsten powders fails to reveal differences in composition which are sufficient to explain the results obtained.

Later investigations will doubtless throw light on this subject. At present, however, at least one grade of commercial cemented tungsten carbide is being produced from selected ore and, although its composition is a usual one, its physical characteristics and performance results are sufficiently unusual to warrant its classification as a distinct grade of carbide alloy.

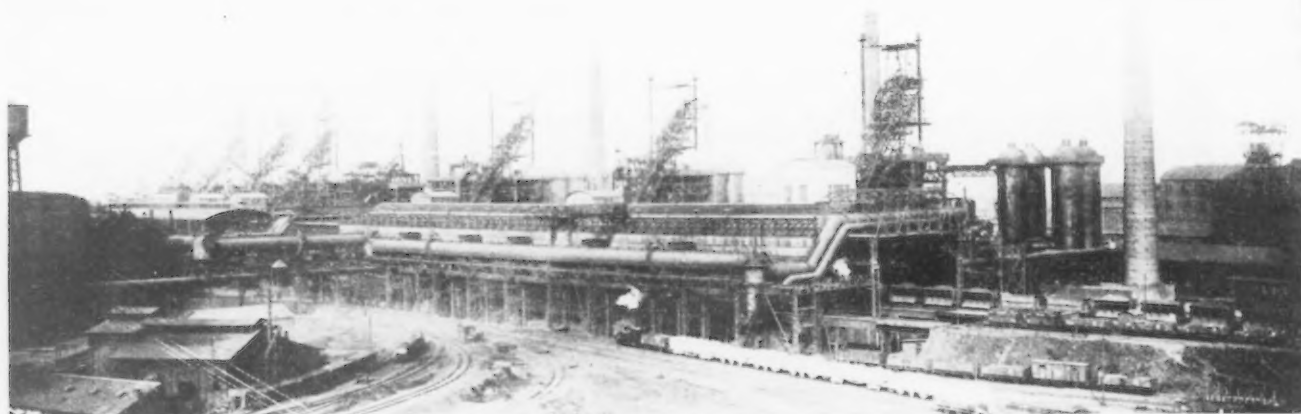
German Dwelling Houses of Steel

THE growth of the use of steel in Germany was discussed at length at the recent meeting of the American Institute of Steel Construction by Otto von Halem, director of the advisory committee of the German Steel Works Union devoted to promotion. Steel frames, he said, have been adapted to small houses.

The competition with masonry is more intense the lower the building is. In order to use the steel framing for the erection of dwellings, it was necessary first to roll special sections for columns and girders and to develop materials for wall building to adapt them to the requirements of steel structures. As a result of considerable research work and testing, we have succeeded in making economical steel structures. It has been proved, for instance, that a recently completed steel framed apartment house in Berlin showed a saving of 11 per cent, another near Hannover, of 16 per cent, as against a brick house of the same size.

Special conditions favored this development. A considerable shortage of dwellings was the result of the cessation of building activities during the war. The demand could only be filled by a mass production of apartments which led to the creation of certain uniform types, and to the erection of hundreds of houses at the same time. Thus by standardizing the different parts and by mass production economy was attained.

After this favorable beginning it was not very difficult to utilize steel frames for single houses too. "We have a number of modern residential structures," he said, "where the frame work shows clearly how the architect has conceived the form of the front walls to harmonize with the steel. In addition to industrial buildings, we are now erecting offices, dwellings, churches and even schools in steel, particularly as a steel constructed school permits light to enter more freely than if the building were of brick or concrete."



The August Thyssen Hütte, Hamborn, subsidiary of the Vereinigte Stahlwerke A. G., is one of the largest steel plants in Germany.

Cost and Workings of Socio-Economic Laws of Germany

By CHARLES M. MILLS

Formerly assistant to president, Standard Oil Co. of Ohio, and also formerly of Industrial Relations Counsellors, New York

ONE must look below the surface to analyze the causes of the decline in both general industry and in steel and iron in Germany. Superficially, one may say the causes are the general world decline, the competition from France and Belgium with generally lower wage scales, and the lack of capital. All these reasons are usually recognized and agreed upon by impartial observers, but the real influences apparently are far deeper. To understand, one must delve into the social and political history of Germany since the armistice.

The exit of the monarchy was followed by revolution, and through this change the man in the street hoped for the realization of an increased status in life. For a time after the republic was declared, the

worker sought to gain his rights in guerrilla warfare upon the owner and employer. For a time there was a swing toward bolshevism. Calmer heads prevailed. The average German could not be persuaded to throw over the capitalistic system and subscribe to Sovietism with its elimination of private property and individual initiative.

The net result was an increasing swing toward a more advanced socialist state. The provisions of the various forms of social welfare legislation were increased and liberalized. Today Germany is the most advanced socialistic state in the world. Having denied bolshevism, from which there is no danger fundamentally, Germany turned pink but not red.

Today one-third of the national budget is expended

Cost in Millions of Marks of Various Forms of Social Insurance

	1913	1924	1925	1926	1927	1928	1929
Invalidity (Old age wage earners)	348	458	710	884	1,125	1,440	1,600
Old age employees (Clerks, etc.)	138	129	192	245	280	317	372
Accident	226	144	223	351	355	381	400
Accident (miners)	75	143	148	172	217	222	226
Sickness	582	1,079	1,403	1,560	1,806	2,066	2,250
Unemployment	(No law)	405	201	1,072	987	953	1,504
		(benefits only)					
Total (marks)	1,300	2,300	2,800	4,200	4,700	5,300	6,300
American dollars	325	575	700	1,050	1,175	1,325	1,575

on the public, and one-fourth of the total population appears annually in one capacity or another on the public payroll.

Government in Private Industry

The government is almost entirely responsible for prices, rents, wages and hours. The prices are fixed by cartels which regulate production and distribution. There are more than 2000 cartels, which, in turn, are subject to review by courts, and under practical control of the Ministry of Economy.

Wages are determined by compulsory arbitration under the Ministry of Labor. The legal 8-hr. day is said to be about 90 per cent effective, certain exceptions being allowed by the courts. Dismissals, layoffs, shutdowns and shop councils are regulated by law. Clerical and technical workers of five years' service must be given three months' notice at close of calendar quarter year. If a shop council supports a workman in his case, he may take it to court on plea of "unfair hardship" and may be reinstated if the court so orders. No member of a shop council may be dismissed while a member.

Under the seriously injured clause in the law, an employer is required to employ a certain percentage of seriously injured men. A seriously injured employee receives four weeks' notice and can only be discharged with consent of an authority. Considering the large number of seriously injured and crippled in the war, this requirement puts a heavy burden upon the employer, although from a social point of view it may be regarded favorably.

Another burden is the requirement making the employers calculate the income tax of employees.

The social insurance laws require the employer to pay 100 per cent of workmen's compensation (as in the United States), 66 2/3 per cent of sickness insurance (33 1/3 per cent is paid by the employer), 50 per cent of invalidity and unemployment insurance (50 per cent is paid by the employers). It is estimated conservatively that on the average 9 1/2 to 10 per cent of the total payroll is paid by the employer for the various forms of social insurance. In addition, there is a practically universal holiday or paid annual

ONE-THIRD of the German national budget is expended on the public. One-fourth of the population appears annually in one capacity or another on the payroll.

The government is responsible for prices, rents, wages and hours of work.

vacation amounting to an average of 2 per cent of the payroll. Of course, the vacation costs may be absorbed and largely offset by labor stability and decline in labor turnover. Nevertheless, it may be said that social insurance and attendant policies are costing the employers from 11 to 12 per cent of the annual payroll.

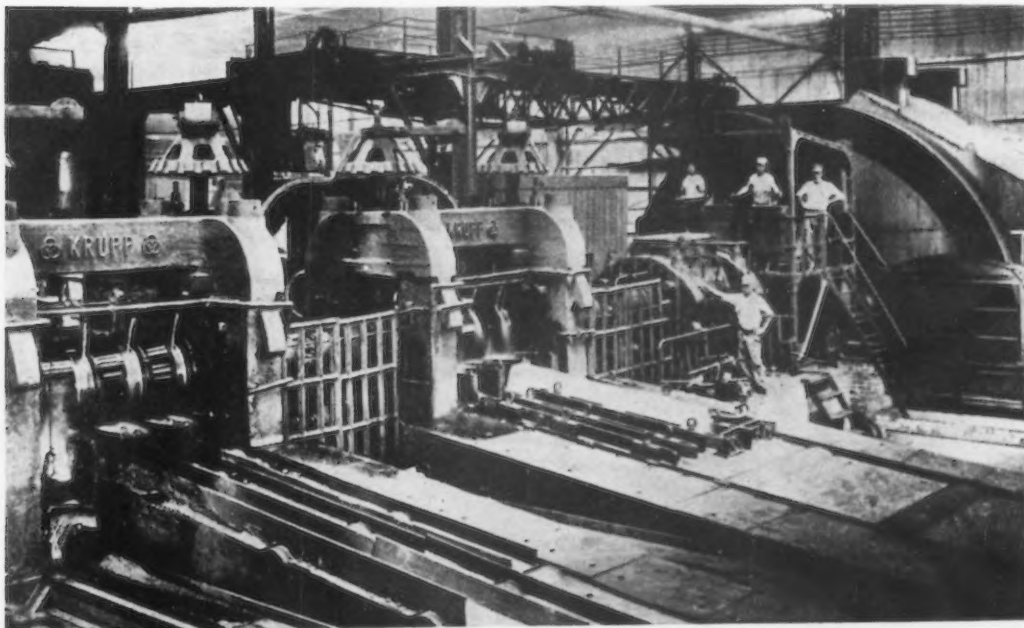
The costs of the various forms of social insurance by years are shown in the accompanying table.

Relation of Social Insurance Laws

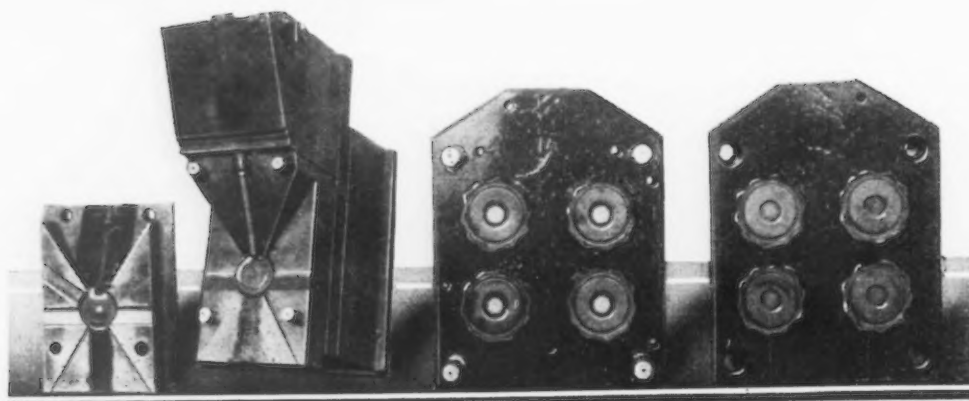
One cannot review the above analysis of the laws and the costs without at once feeling that there can be no turning back once the Rubicon has been crossed. Even the most conservative industrialist would not agree to the elimination of any of the five forms of social insurance. The industrialist, however, does most strongly object to what he deems are the abuses that have grown up in the administration of the law.

Under the sickness insurance law, a worker may obtain medicines in kind and go to a doctor of his own choice. The doctors receive a small fee from the State for each call of the worker who claims sickness. Under such circumstances it is not surprising to hear widespread complaints of malingering, particularly the charge that workmen who know there is an impending layoff will seek the sickness benefits first before going on the unemployment dole. They are thus able to spread their benefits over a combined period of sickness and unemployment. Professor von Haberer, of Düsseldorf, reported at the Congress of

(Concluded on page 1437)



A TWO-STAND blooming mill recently installed by the Friedrich Krupp A. G., Essen, Germany, in the sheet rolling mills of the Kawasaki Dockyard Co., Kobe, Japan. It is a unit of complete equipment for semi-continuous sheet production. From here, the blooms move into a continuous finishing mill.



Properties of Die Castings Affected by Casting Practice

SUCCESSFUL operation of the die-casting process depends primarily on four major factors: Composition of the alloy, rate of cooling, the casting machine and the die, according to Charles Pack in a paper, "Influence of Casting Practice on Physical Properties of Die Castings," presented before the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers during the National Metals Congress at Chicago this fall. Each of these factors has an important bearing on the physical properties of the resultant product. Analysis discloses that several of these major factors may be broken down still further. The rate of cooling involves casting temperature, temperature of the die and wall thickness. The casting machine calls to mind the subject of pressure, gates and speed of operation. Involved in the problem of dies are the subjects of gates, vents, fillets, ribs and bosses, core removal and condition of the die.

Possible variations in the rate of cooling are great in die casting practice and control of the cooling rate is difficult. Zinc-base alloys, which are extensively used in die casting practice, are of a highly crystalline nature and are dependent upon rapid cooling for their useful properties. Variations of over 25 per cent in the physical properties of zinc-base die castings may be attributed entirely to variations in the rate of cooling during the casting operation.

Make Castings Near Melting Point of Alloy

Usually the best casting temperature for an alloy is above the melting point but as near as possible to the melting point of the alloy. In commercial practice, casting temperatures are often raised above the known optimum because it presents the simplest method of overcoming visible defects. It is an easy method of solving many die-casting difficulties, but

far from the best. Best results will be maintained if the plant metallurgist will establish a definitely known optimum casting temperature and insist that this temperature be maintained in practice.

As a general rule, the more rapid cooling of the metal will result in castings having the best physical properties. The operating temperature of the die is the most important factor in controlling the rate of cooling of the metal and it follows therefore that the best physical properties may be expected when the die is operated at the lowest possible temperature. Unfortunately, this rule cannot be taken literally, without considering the other factors that enter into the process. More particularly is this rule tied up with the speed of operation of the machine.

Physical properties of a die casting will vary with the cross-section of the casting, and proportional lower physical properties may be expected as the wall thickness of the casting increases, due to the slower rate of cooling of the heavier castings. Furthermore, the possibility of blow holes due to trapped air and shrinkage voids becomes much greater as the wall stock increases, which also tends to reduce the average physical properties of the casting.

Pressure, Heating and Speed Are Important

The particular items in machine design that influence physical properties of the resultant product are pressure, heating and speed of operation. Many manufacturing problems of die casting plants may be directly attributed to lack of sufficient pressure behind the metal. The plunger type of machine has the advantage in that it is possible to produce any desired pressure by the application of the required force behind the operating plunger. Its main disadvantage lies in the fact that, at casting temperatures of over 850 deg. Fahr., there is a tendency for the plunger to

GENERAL factors influencing the physical properties of die castings are discussed by the author, who is a recognized authority in this field.

Four major factors are involved in successful die casting practice: Composition of the alloy, rate of cooling, the casting machine and the die.

Items in machine design are pressure, heating and speed of operation.

Two general principles govern gating. Upon the proper gating depend the number of blow holes, inclusions, etc.

freeze in service, which precludes its use for aluminum and copper-base alloys.

For the casting of aluminum, machine designers have discarded the plunger type of casting machine and the direct air machine has been developed. Machines of the air pressure type are operated under pressures varying from 250 to 500 lb. per sq. in. It is doubtful whether it will be practical to operate this type of machine at much higher pressures. Although air pressures up to 1000 lb. per sq. in. are being used in other industries, the use of such pressures in this type of machine will prove dangerous and expensive.

It is entirely practical to operate a plunger-type die casting machine with nozzle pressures exceeding 5000 lb. per sq. in. It would seem therefore that where the plunger type of machine can be used, the best result will be obtained with this type of machine. There can be no doubt that the future development of the aluminum die casting industry must be limited if the manufacturing process will be limited to operating pressures of 500 lb.

Gating Governed by Two Principles

Two general principles of gating are used in die casting practice. There is much to be said in favor of both the side gate and the center gate principle.

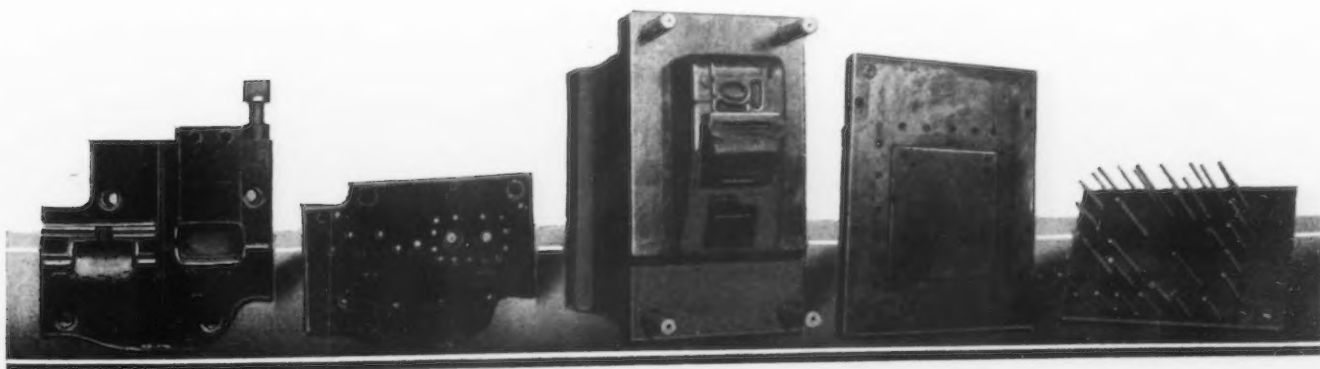
The speed at which a casting machine operates is that time which elapses between the injection of the metal into and ejection of the casting from the die. This has a vital bearing on the physical properties of the resultant castings. When the metal is forced into the die, it solidifies instantly and that solidification is accompanied by reduction in volume, commonly

called shrinkage. Although the designer allows for what he terms shrinkage, it is physically impossible for the casting to contract while it is in the die. The casting is surrounded by the solid, incompressible steel and shrinkage incident to the solidification of the metal is converted into a tension strain on the casting. The alloy must stretch sufficiently to compensate for this reduction in volume.

A further reduction in volume takes place, due to the cooling of the casting from its melting point down to the temperature at which it is removed from the die and from that temperature to room temperature. The only shrinkage obtainable in die casting practice is that incident to the cooling of the casting after it has been removed from the die. If a casting were allowed to cool in the die until it reached room temperature, it would be found that the dimensions of the casting would conform to those of the die cavity. Reductions in volume incident to solidification in cooling thereby would be converted into tension strains, which would have stretched the casting to the dimensions of the die.

This, of course, does not apply to shapes that are unrestricted in shrinkage in the die, such, for example, as the diameter of a solid disk. It seems evident that castings, permitted to cool in the die, must be placed under tremendous strain and a tensile strength of such casting must suffer materially. Most commercial die castings from zinc-base or aluminum-base alloys, if allowed to cool in the die to room temperature, would come out of the die badly cracked.

Assuming the casting temperature and the temperature of the die to be constant, it is evident that the temperature at which the die casting will be re-



moved from the die must vary directly with the speed of operation. Since it has already been shown that the best results are obtained with low casting temperatures and cold dies, it follows that, in order to maintain these conditions, we must have speed of operation or the beneficial effect of the rapid cooling of the metal is more than counteracted by the detrimental effect of cooling the casting within the die. Therefore, the most desirable operating conditions of a casting machine from the standpoint of obtaining the maximum physical properties from the resultant product, are: Low casting temperatures, cold die, high pressure and rapid ejection from the die.

It also follows that, with a machine that operates slowly, it is best to operate the die at a higher temperature. With a fast machine it is possible to obtain better castings, since it is possible to operate with a comparatively cold die and eject the casting from the die before it has cooled to any appreciable extent. Also, under a given set of operating conditions, the alloy that will produce the most satisfactory die castings is the one that is best suited to withstand the strain set up incident to the solidification and cooling of the metal in the die.

Blow Holes Depend on Gating

Upon the proficiency in gating will depend to a large extent the number of blow holes, dross inclusions, etc., that will occur in the castings. A long, thin gate usually is preferable to a short, wide one. However, no universal rule of gating can be laid down that will apply equally to all types of casting machines and the variety of castings that must be considered.

In order to determine the direction of flow of the metal in the die, a mixture of heavy oil and graphite may be injected into the nozzle of the casting appa-

ratus or into the main gate hole of the die. A casting is then made with a restricted pressure. By varying this pressure, it is possible to obtain castings either partly or entirely filled out, and the flow of the metal will be indicated clearly by the dark streaks left by the oil and graphite in the casting. This method makes it possible for the die designer to locate air traps and other objectionable conditions which will have a detrimental effect upon the physical properties of the castings.

Bosses may be used to break up shrinkage strains where ribs cannot be used. Without fillets, there may reasonably be expected cracks in the corners if the die is operated slowly. Cores should be removed from the casting as rapidly as possible in order to obtain castings of maximum physical properties.

Physical properties of die castings may be greatly reduced by strains set up in the castings through the improper ejection of the castings from the die. Improper ejection may result from poor alignment of the ejector mechanism of the die, under-cuts, insufficient taper, burred or nicked edges or any other condition existing in the die that may tend to make the ejection of the casting from the die more difficult.

Discussion by Sam Tour

Discussion of this paper was led by Sam Tour, consulting engineer, New York. He pointed out that, if the gate inlet is too small, the effect of added pressure on the machine will be partly or completely lost. He took exception to the use of low pressures for determining, by means of oil and graphite, the flow of the metal in the die. He suggested that studies of this kind can best be made by means of the X-ray on finished castings, made under standard production methods.

British Characterization of American Research

RESEARCH in the United States came in for qualified praise at the hands of Loughnan StL. Pendred, editor of *The Engineer* of London, England, in the course of his presidential address to the Institution of Mechanical Engineers, delivered Oct. 17. "Only a small part of the vast laboratories that one finds in America," he said, "is occupied by scientists. Only a few are engaged upon the exploration of the mysteries of nature; only a few are searching in the unknown for something that may be profitable to man."

"What the greater number are busy upon is the development of new inventions—a new telephone receiver, a new camera, a new electric lamp. When you hear of millions of dollars being spent upon research in America, please remember that much of it is expended upon that kind of research, and that the major part of the great buildings and a large proportion of the huge staffs are dedicated to the trial and error system of the development of inventions."

"That, of course, is very important and even essential when mass-production is the object. When a costly plant must be laid down for manufacturing purposes, it is clearly imperative that every means of reducing

cost of manufacture, and every means of improving the product, should be examined before it is marketed. An error in design discovered in service or during manufacture is far more costly than a complete preliminary investigation before the plant is laid down."

"Do not think, please, that I am in any way belittling scientific research; that is very far from being my intention. What I ask you to remember is that while scientific research must be carried out, it is of not less importance, sometimes even of greater importance, that the development of inventions should be supported. If we do not develop inventions ourselves, and if our manufacturers do not spend money upon them, then we shall have to remain in the position—so painful to the pride of British engineers—of being purchasers of foreign inventions."

Mr. Pendred had introduced the subject with the statement that it is often said, presumably among the British, that they do not spend enough money on research, and he mentioned that the examples of other nations are held up for proof. "Let us remember," he said, "what a great deal of foreign research really is. It is not scientific research."

Chromium Plated Fittings in Power Plant

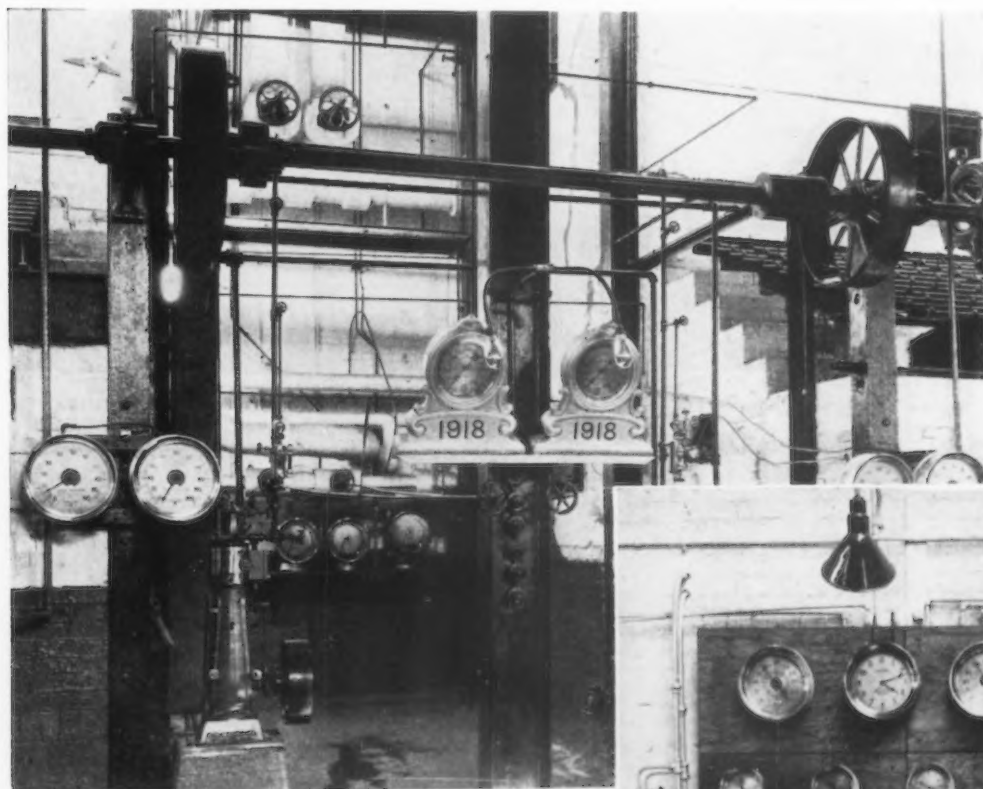
Reduce Labor and Add Beauty

ALTHOUGH several automobile companies have chromium-plating departments, it is believed that the Oldsmobile-Viking factory at Lansing, Mich., has the only department in which all possible parts are chromium plated. This is the power plant, where everything plateable is covered with chromium. This includes valves, inlet pipes, switches, control handles and instrument dial frames.

The brightened appearance has served as an

added incentive to power plant employees to keep the remainder of their equipment as clean and attractive as the numerous plated parts. The use of chromium plating also has been a labor saver, for it now is necessary only to go over the plated material with a cloth once a week instead of having to polish the brass-work daily, as formerly. The improvement likewise has stimulated a feeling of pride among employees in the unique distinction their department enjoys.

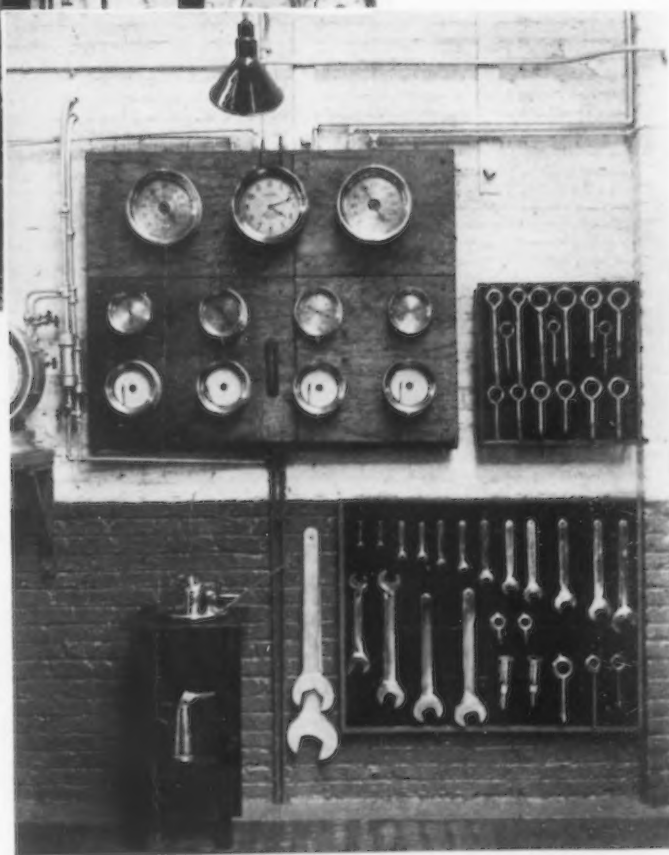
This innovation of a chromium-plated department is made by the company which claims the distinction of being the first to develop and introduce chromium plating to the automotive industry.



IN the boiler room (above) the instrument dial frames are plated with chromium.

In the engine room (right), the wrenches, oil cans and several other tools, as well as the dial frames of the instruments, are chromium plated.

In the power plant engine room, all valve wheels and other parts, usually finished in brass or nickel, are plated with chromium.



Light Steel Building Material for Quick, Simple Erection

THE accompanying illustrations show some of the features of a system of steel building construction material. It has been developed to meet a rising demand for steel building elements that are individually light, structurally adequate when assembled, capable of manufacturing more or less along mass production lines, highly portable for carriage to the place of erection and put together with such simple tools as the hammer.

▲ ▲ ▲

LIGHT joists of T-bars, flats and rounds (below), may be assembled in the nearby shop. By means of wire hangers the perforated metal is supported to hold poured gypsum for the ceiling. Perforated metal, or form plates, is unrolled on the joist tops for the floor.

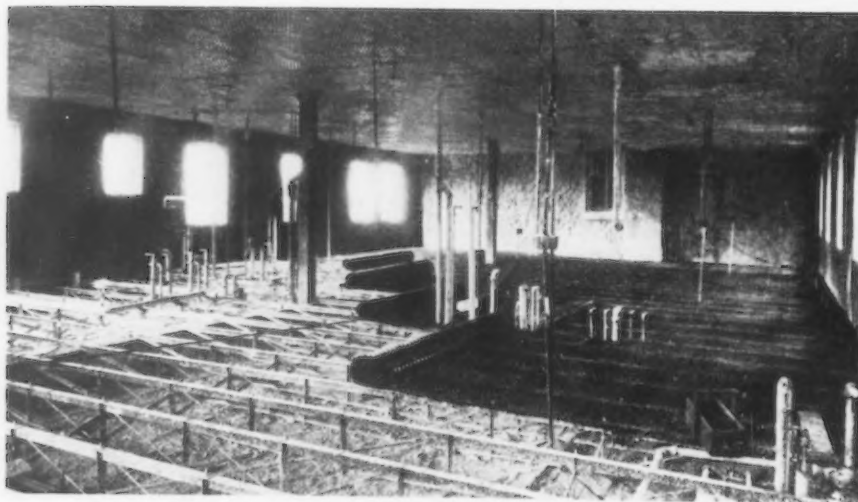
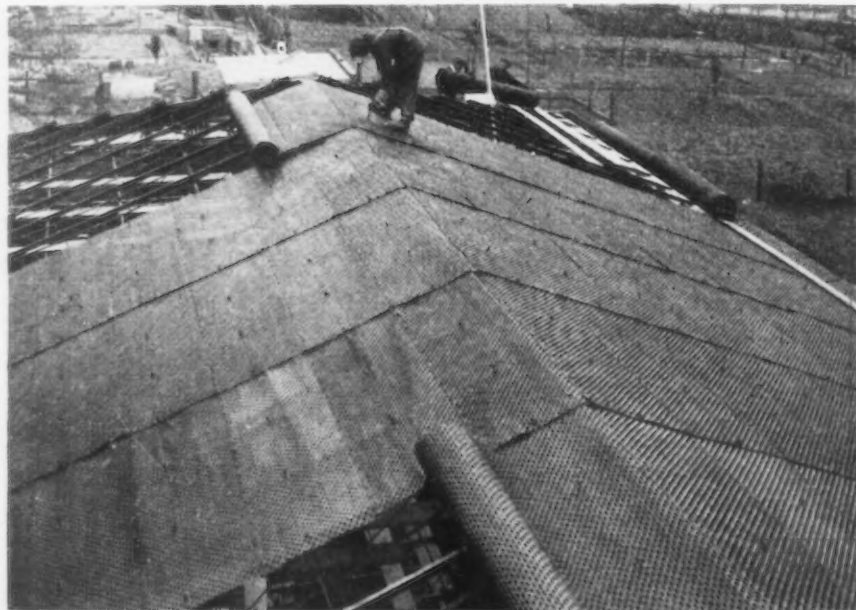
Similar applications (right) cover the use of the material for roof construction.

may also be folded for column and pilaster applications.

In the Norristown hospital the joists are parabolic trusses with all that this means for efficient use of load carrying members. The hori-

view shows the form plates being laid for the floor base. Pointed lugs extend sufficiently above the joist tops to serve to catch and hold the perforated metal when it is unrolled and spuds are hammered upon the points, thus fixing the form plate in position. The plates are then ready for the laying of the floor material proper. The exterior view illustrates how quickly the roofing may be laid, this one receiving a pouring of gypsum for a later covering of slate.

Saving in material as well as fa-



The achievement is that of the Pawling System, Inc., 4417 North Sixth Street, Philadelphia, and the application is that of the Riverview Hospital at Norristown, Pa.

No attempt will be made to go into details. In its essentials the system includes a skeleton beam or joist, made up of light members put together at the shop, and perforated heavy steel sheets, or form plates, attached under the joists for ceilings, on top of the joists for floor work, or, as here shown, on top of them to form a roof base. The form plates

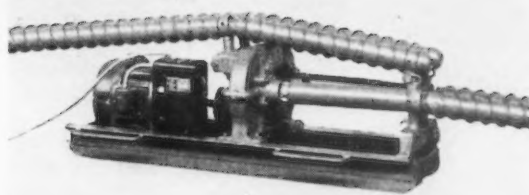
horizontal top member is a tee bar. The verticals are slotted flat bars fitting into the tee at the top and engaging the bars, usually round, of the parabolic bottom of the truss. A few sizes of both verticals and diagonals suffice for the whole range of sizes of finished joists.

The form plates are fastened readily in an ingenious way, and upon them gypsum may be poured. Thus a space is provided above the ceiling for piping and other conduits as well as a support for workmen during the progress of building. The interior

cility in manufacture and erection are claimed. A case in respect to the former is cited of a truss of this construction 38 ft. in span length and 24 in. deep that weighed in all 350 lb. Being without diagonals, it was loaded uniformly with pig iron to an amount of 200 lb. per lin. ft.

Freyn Engineering Co., 310 South Michigan Avenue, Chicago, reports the following orders: From Bethlehem Steel Co., eight electric roll heaters for sheet mills at Sparrows Point, Md., and a continuous stock-line recorder for the blast furnace plant at Sparrows Point; from Illinois Steel Co., three pressure-type Theisen disintegrator gas washers for cleaning of blast furnace gas at South Works, Chicago; from Carnegie Steel Co., two continuous stock-line recorders for the Mingo Junction blast furnace plant, and from Tennessee Coal, Iron & Railroad Co., six electric roll heaters for its new sheet mills at Fairfield, Ala.

"The Ninety-two Elements" is the title of a small four-page leaflet issued by the St. John X-Ray Service Corporation, 505 Fifth Avenue, New York, which gives the names, atomic numbers, symbols, atomic weights, melting points and years of discovery of the chemical elements.



Flexible Elevating and Tying Conveyor

A NEW portable, flexible, power-driven elevating and tying conveyor has been introduced by the Clark Tructractor Co., Battle Creek, Mich. The TwinVeyor uses a new principle—two external spiral tubes are turned toward each other by a power head. Anything placed on the conveyor travels forward rapidly, perfectly balanced.

This equipment is reported to have made notable cost reductions in handling raw materials and finished products—in bags, bales and bundles. The equipment finds other applications in handling crates and boxes. And experiments are being made in handling the finished product itself, without packaging, where its shape and size will permit the spirals to get hold of it.

A standard unit consists of six 8-ft. dual sections and a power head. Each section is light and joins to the assembly with an automatic lock. It is easily shifted about by one man and the entire 50-ft. line can be assembled or disassembled in 6 min. Flexibility is secured by the ability of any joint to take a 15-deg. angle horizontally, or it may be tilted 15



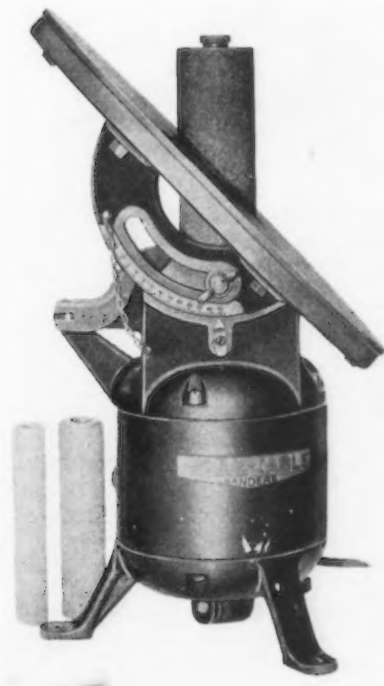
Tying conveyor, with line resting on stack already made, is shown above. A "hurdle section" arranged over intermediate power unit is shown at upper left.

deg. up or 10 deg. down. In the elevating operation, sections may be supported by the material already stacked.

A hurdle section permits any number of 50-ft. units to be hooked together, forming a continuous line of any desired length. The traveling load hurdles each power head in the line. Right and left spiral chutes are provided for shunting the load from one TwinVeyor line to another with-

out manual handling, thus making right-angle turns simple.

An extension cord attached to the power head may be plugged into any power line. The flow of power along the entire unit is smooth and constant. Two complete 50-ft. TwinVeyors, disassembled in 15 min., can be loaded on to one factory trailer. Power head section weighs 365 lb., each 8-ft. dual section 140 lb., entire 50-ft. assembly 1205 lb.



Bench Oscillating-Spindle Sander

A NEW model sander, Type O-4, is being put out by the Porter-Cable Machine Co., Syracuse, N. Y., designed for that type of intermittent work found in pattern and woodworking plants. It is planned to save many hours of sanding operations on curved, irregular and angular internal work on wood or metal, as found in the manufacture of furniture, patterns, fixtures, novelties, etc. Suitable abrasive can be furnished for wood or metal work.

It is useful on small core box patterns and does away with much hand gouging. Cam pattern and gear cover work are said to be simplified with this machine. Patterns thus made are correct as regards draft, which saves time and changes in the foundry.

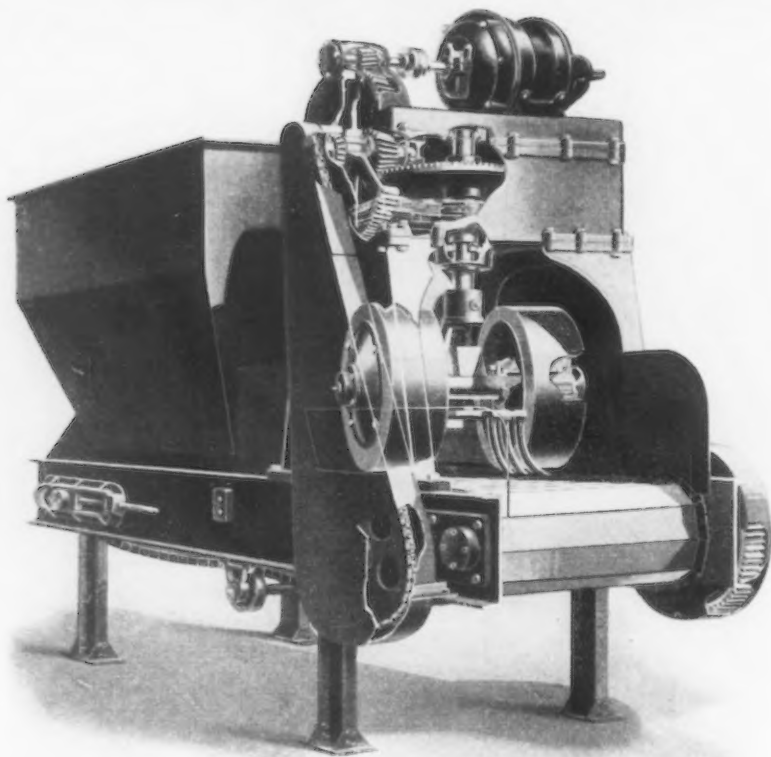
Several important changes have been made in this machine. The split-phase type of motor has been replaced by one of $\frac{1}{4}$ hp., specially built, of

the repulsion induction type. This motor can be run on either 110 or 220 voltage.

There is a longer motor shaft, of $\frac{5}{8}$ -in. diameter, extending through the spindle. A $\frac{3}{4}$ -in. steel sliding sleeve fits this spindle and is driven by the motor shaft, which is square at the top. This eliminates small keys and keyway, which have a tendency to wear rapidly.

The table is supported by a segment which gives a perfect center. This segment is marked by degrees and allows the table to be tilted 45 deg. down. Accurate drafts or angles can be obtained quickly in this manner. The spindle oscillates 90 times a minute and has a $\frac{1}{2}$ -in. travel. It revolves at the same speed as the motor, which is 1725 r.p.m.

The entire machine is of ball-bearing construction, including the motor and the oscillating trunnion.



Automatic Sandmuller with Variable Ratio

A NEW machine has been added to the extensive line of foundry equipment of the Beardsley & Piper Co., Chicago. This is a new type of mulling equipment called the Sandmuller. It consists of three parts—the muller itself, an endless apron conveyor mounted underneath the muller, and a small sand storage hopper mounted on end of apron.

A heavy semi-steel gear housing has the driving motor on top. The lower part is provided with leg supports which mount on the main frame of the endless apron conveyor. Suspended from the gear housing are the muller wheels, which are self-aligning and also adjustable for wear. The gear housing is fully equipped with Timken bearings.

Motor pinion and gear are helical cut gears made from heat-treated steel. The bevel pinion and gears have cut teeth. All gears and shafts run in an oil bath, which also automatically oils all the Timken bearings.

Extending through the side of the gear housing, the bevel pinion shaft forms the drive for the apron conveyor.

Muller wheels are provided with a heavy rubber-tired tread. This grips the sand and is said to give a far better mulling action than steel wheels. It is believed that rubber

will last longer than steel where abrasive action of this kind is concerned. The manufacturer of these muller tires believes that they will last longer than two years, even under continuous mulling action.

Vertical adjustment for wear of muller wheels is provided. The tires are secured by means of four holding lugs identical with standard automobile rim practice, and easily and quickly removed and renewed.

The endless steel apron conveyor is carried on three strands of heavy roller chain, secured to the apron by attachment links. The roller chain is traveling on 60-lb. railroad rails, which form a level support for the apron. The tops of the aprons are protected from wear by $\frac{3}{8}$ -in. wearing plates, so made as to be easily renewable when worn. This construction provides a smooth, even top for the conveyor and allows the sand plows to be operated in the sand to a position of $\frac{1}{4}$ in. from top of apron.

Drive for the apron conveyor is obtained from the extended shaft of the muller, and is through the roller chain and cut spur gears. By this method any ratio of mulling can be obtained by changing one sprocket.

A 5-ton sand storage hopper, located at one end of the apron conveyor, is provided with an easily operated gate and leveling device on

the discharge end. This controls the distribution of sand bed on to the apron in any depth from 1 in. to 6 in., 4 in. being the approximate correct depth of sand for thorough mulling.

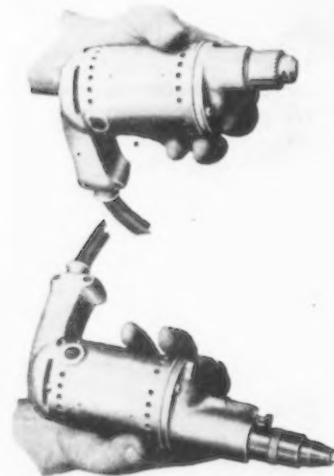
This machine has capacity for 20 to 40 tons an hour. The entire unit is driven by a 15-hp., 1200 r.p.m. motor. All mechanisms, such as exposed gears and chains and sprockets, are properly guarded for protection against dust and personal accidents.

Spaces provided between the storage tank and the mulling unit are for the adaptation of mechanism for feeding sea-coal, bonded material, water, or any material that is to be added when mulling into the sand.

Small Electric Drill and Screwdriver

TWO new tools—a 3/16-in. electric drill and a small electric screwdriver, called the Universal Twins, are being put out by the Black & Decker Mfg. Co., Towson, Md. These tools have been designed for doing tedious jobs and working in close quarters.

They are short and the body diameter is small, with exterior surfaces rounded to afford easy grasp at any part. In addition, they are production tools, being ruggedly constructed,

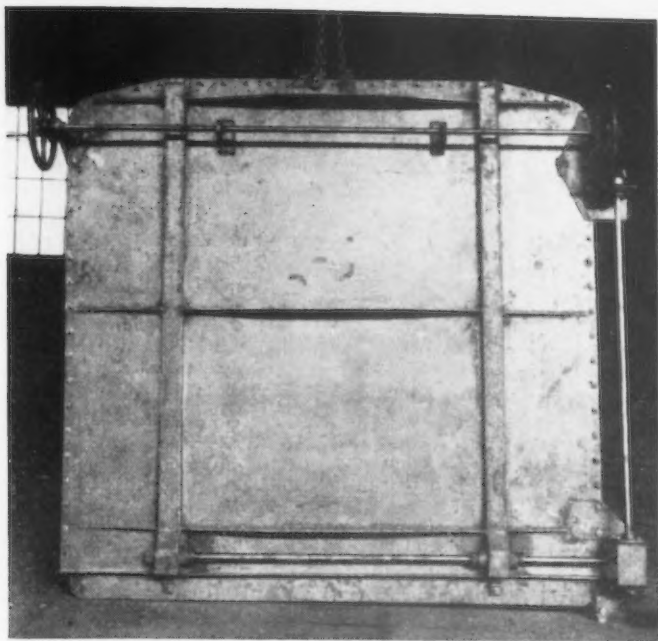


light in weight, powerful in operation and easy to handle.

The screwdriver has an adjustable friction clutch which drives the screw "flush" and releases immediately, without danger of marring the screw head or the surrounding surface. This clutch can be set to any desired tension by means of a knurled thumb-screw on the gear case.

The drill is fitted with a three-jaw geared chuck of 3/16-in. capacity and has all the features found in Black & Decker electric drills of larger size.

Each tool has a universal motor with ball bearings on the armature shaft, and also on the spindle, and is equipped with a three-conductor cable and attachment plug. They can be furnished for 110, 220 or 250 volts.



New Blast Gates Are Arc Welded

ELECTRIC arc welding is being used in the fabrication of a new line of blast gates being manufactured by Connery & Co., Philadelphia. This new line consists of new shapes, and the redesign of old shapes, all fabricated of arc-welded steel.

The square-type gate shown is one of the new shapes, which are being manufactured in a complete line of sizes. By using arc-welded steel construction it is possible to use standard steel shapes, fusing them together at their edges and making a gate which is air tight. The welding current used in fabricating these gates was supplied by Stable Arc welders made by the Lincoln Electric Co., Cleveland.

The round-type gate shown is also

of arc-welded steel construction. It is designed to replace a gate of cast iron construction which was identical in appearance. The gate shown is one of a complete line of round arc-welded steel gates made in various sizes. It is stronger and less liable to breakage than its prototype; yet it is much lighter, it is stated.

Arc-welded steel construction of the blast gates permits a variety of advantages. These gates can be made up from standard steel plates at a reduction said to reach from one-third to one-half in labor and material costs. The fabricating time is greatly reduced, due to the fact that these gates do not require much machining and are not subjected to foundry delays.

Both the square and round type blast gates are of arc welded steel construction. The round gate was formerly of cast iron

to be heated is placed between the secondaries, and rests on top of a fire-brick floor, which serves also as the roof or protection over the top of the transformer. One end of the secondary is stationary and the other movable to allow for expansion, difference in length of bars and other necessary adjustments.

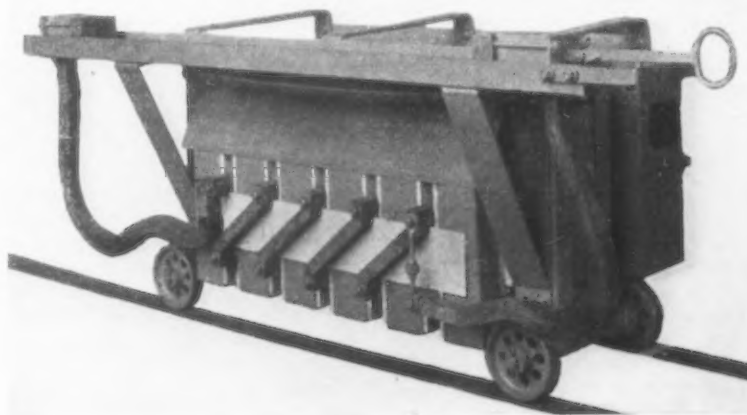
The complete unit weighs approximately 5000 lb. It is 2 ft. wide, 7 ft. 6 in. long, overall, and stands about 3 ft. high. Mounted on wheels, the unit is in a measure portable. It can be used for heating stock for hand-feed rivet or bolt-making machines, bending or upsetting purposes and similar work.

Bar Heater for Stock Up to 1 3/4 In. by 6 Ft.

ONE-INCH bars 6 ft. long are heated to 1900 deg. Fahr. in 1 min. by the new 6-ft. Berwick electric bar heater brought out by the American Car & Foundry Co., 30 Church Street, New York. This heater has capacity for stock ranging from 3/8 to 1 3/4 in. in diameter, and adjustment is provided for length variations up to approximately 6 in. Bar heaters of similar design can be built for any length of stock from 2 or 3 ft. to 8, 10 or 12 ft. with 18-in. or greater adjustment for length variations.

The unit consists of a large capacity transformer having a low-voltage secondary capable of carrying high amperage. It is single phase and, as it is designed to heat one bar at a time, there is but one pair of sec-

dary leads to the ends of which large copper blocks are fastened, these lying in the same horizontal plane. The bar



Doelger & Kirsten, Milwaukee, manufacturer of shears, have appointed Waddell Brothers, Fort Worth, Tex., as representatives in Texas and southern Oklahoma.

Recirculation and Incineration in Japanning and Baking

BY A. E. MAEHLER*

GROWING popularity of baked enamel and japanned finishes, accelerated possibly by their widespread use in the automotive industry, has brought about the rapidly increasing use of industrial ovens for these and other processes requiring temperatures ranging from 250 to 700 deg. Fahr.

A new type of industrial oven heater, known as the Maehler-Universal heater, has been developed by the Paul Maehler Co., Chicago. Use of low-pressure heated air places the heater outside the oven, where it is accessible at all times during operation, and permits the use of efficient heating equipment.

Drawn from the top of the oven by a high-temperature suction fan located at the exhaust end of the heater, the circulating medium passes through the heater and returns through the fan to the bottom of the oven. The fan being of the suction type drawing the air through the heater, and an independent throat and air intake for gas combustion being provided, a soft, quiet visible burner flame is produced, and the use of a visible pilot and automatic electric ignition are possible.

An adjustable fresh air inlet at the intake end of the heater permits the introduction of fresh air into the heater at room temperature, when desired.

In operation, the air from the oven with its vapor content passes through the heater flame, where all explosive gases developed in the oven are incinerated. Thus the dangerous japan or enamel vapors are completely destroyed. In their destruction a notable economy is effected, for the burning of these vapors generates approximately 150,000 B.t.u. per gallon of enamel distilled from work in process.

The heater, which under repeated tests is said to have shown a continuous efficiency of 95 per cent to 99 per cent, operates at 33 1/3 per cent above oven temperature. At 450 deg. Fahr. oven temperature, for instance, the circulating air is normally returned to the heater at 400 deg. It is therefore necessary to raise its temperature but 50 per cent to maintain the oven temperature. The fuel economy is readily apparent.

Thermostatic control, which can be set for any desired temperature, controls the fuel flow to maintain the oven temperature at the setting. Notwithstanding the constant recirculation of the air, repeated tests have shown the loss in oxygen content of

the circulating medium never exceeds 2 per cent, even after many hours of operation.

Full circulation of the air to all parts of the oven is provided by the slight plus pressure generated and the variation in temperature at any two points in the oven has been found rarely over 6 deg. and never over 10 deg. The floor, usually the coldest part of the oven, becomes the warmest.

Using slotted ducts for the delivery of the heated air to the oven, and for the exhaust, the full dimensions are made available for work in process and the walls are smooth and readily cleaned and kept free from dust.

The recirculation and incineration system has been in use for three years and applied to more than 250 old and new oven installations. It has been found especially valuable in continuous-type ovens. Installations requiring as many as six heaters, delivering heat at different temperatures to zones in long continuous ovens, have been made during the past year.

Tells Why Machine Tools Form "Key Industry"

ERNEST F. DU BRUL, general manager, National Machine Tool Builders' Association, in a radio talk over station WOR at Newark, N. J., Saturday evening, Oct. 22, referred to the machine tool industry as "the single one which is preeminently necessary to our modern civilization."

"Of our 125 millions of population," said Mr. Du Brul, "only ten millions are employed in manufacturing in this country. Of these, less than 600,000 are regularly engaged in the making of shop machinery of all kinds. And of these, less than 60,000 are engaged in machine tool manufacturing. To make 65 billions of dollars' worth of manufactured products last year in America, about five billions of dollars were spent for all the machinery we made, and less than 200 million dollars of that machinery money went to supply all the other industries with the machine tools they needed. So you see how small is this group of factories and employees whose product is so necessary to our present civilization.

"To show you the importance of this small industry in our present civilization, I ask you to imagine what would happen if some superhuman power were to destroy all the machine tools in the world, and prevent us from making any more. Think of the industries that would be wiped out over night. We could make no more automobiles, no more electrical

devices, no more household conveniences, no more plumbing fixtures, no more railroad equipment, no more airplanes, no more steel ships, no more movies, no more machinery of any kind. All the other machines we have would soon stop running, because without machine tools we could not produce repair parts to keep them going.

"In a very short time we would have to go back to the primitive methods of production and transportation. Most of our men would have to go back to digging a very poor living out of the ground, by sheer muscle power of men and animals. Our women would have to spin yarn and weave cloth by hand, as their ancestors did. We would have as hard a life as our ancestors had—and very many of us would starve to death, before the world got settled down at the low standard of living that prevailed only 150 years ago.

"Looked at in that light, it is plain that this small machine tool industry is indeed the key industry that holds the arch of modern civilization together, and that machine tools are indeed the master tools of industry."

Duronze—A High-Tensile Silicon-Bronze Alloy

DURONZE is the name of a new alloy developed by the Bridgeport Brass Co., Bridgeport, Conn. It is a new high-tensile silicon-bronze with a tensile strength of about 42,500 lb. per sq. in. in the annealed condition. After cold drawing it is reported to have a tensile strength of 129,900 lb. per sq. in. and not to be brittle as is the case with some brass and nickel-silicon alloys. Further facts are as follows: In rod form, with a tensile strength of approximately 100,800 lb. per sq. in., it can be readily upset and roll-threaded in the manufacture of cap and machine screws. Heads formed by the cold upsetting process are not weak and brittle. Duronze can also be hot-worked and hot-forged.

It is claimed to resist corrosion better than brass or copper, standing up remarkably well in dilute sulphuric and dilute hydrofluoric acid. Although not designed as an acid-resisting material, it stands up as well, and often better than many expensive so-called acid-resisting alloys, it is stated.

A further claim is that it is immune from season cracking, making it very desirable for use in outdoor construction work, where weathering and sudden changes in temperature destroy the usefulness of brass bolts. Duronze does not crack under the action of ammonia gases, which seriously injure brass and nickel silver, it is asserted. It does not become brittle when immersed in mercurous nitrate solution, which completely amalgamates with brass and causes it to become fragile. This material is obtainable in sheet, strip, rod and wire form.

*Secretary, Paul Maehler Co., 2208 West Lake Street, Chicago.

Diamond Boring Machine Roughs and Finishes at One Loading

ROUGH and finish boring of pistons, connecting rods and similar work with diamond or tungsten-carbide tools are accomplished at a single loading of the work and with a single fixture on the precision boring machine recently brought out by the Ex-Cell-O Aircraft & Tool Co., Detroit.

On the machine illustrated three pistons are rough and finish bored simultaneously; three spindles at one end of the machine carry the roughing tools, while the three spindles at the opposite end carry the finishing tools. A hydraulic fixture, operated directly from the hydraulic unit on

the crank is again turned; this closes the hinged cover and moves the equalizers into position, aligning the pistons for rough boring. The clamping mechanism located in the top of the cover fastens the pistons securely in place. As soon as this locking operation is finished the equalizers are withdrawn and the table is started automatically.

The table moves the fixture to the roughing position, and when the roughing is completed it returns to the opposite side for finish boring. Finally, it returns to the center of the machine, where it stops automatically. It will be noted that the operator

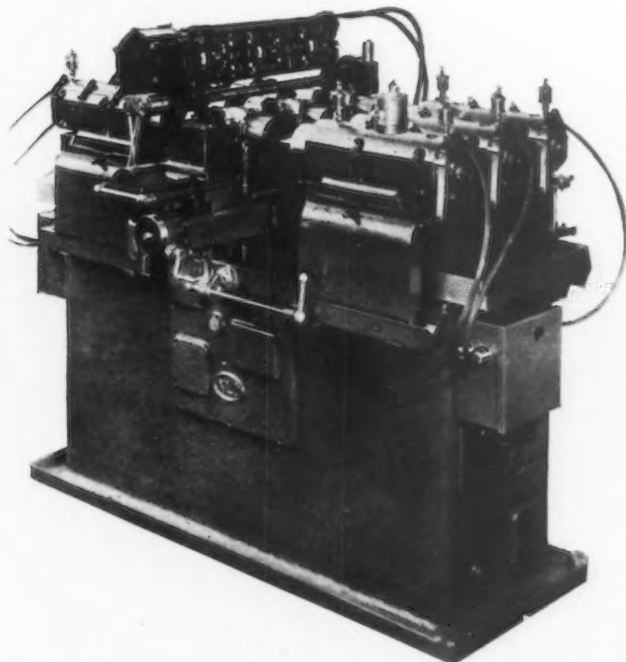
turns the hydraulic control crank only twice to complete the entire cycle.

The base of the machine is a heavy one-piece casting with 1-in. walls and is reinforced with cross ribbing. The complete machine weighs approximately 6600 lb. and covers 14 sq. ft. of floor space. The base proper is of three-point support type. The inside forms oil and coolant compartments. The ways, one V type and the other flat, have large wearing surfaces. All lubrication is furnished by the hydraulic unit of the machine proper. Oil is forced in at one end of the ways and circulated constantly around the rollers, returning via the opposite end to the sump pump.

The table, which weighs approximately 900 lb., has a maximum stroke of 16 in. Its finished ways are of such length that they never uncover the ways of the base during the operating cycle. The table is actuated hydraulically through a feed cylinder clamped to the bottom. The cylinder contains a double-end piston rod, the ends being secured to the end walls of the base. The piston rods are tubular and the oil intake and outlet is through these holes with the ports in the piston proper.

At both ends and cast integral with the base are heavy side rails that serve as spindle bridge supports. The side rail on one side is finished flat while that on the other is of the V type. The legs of the spindle bridge are finished to conform to these ways. The bridges have liberal end adjustment so that they may be set to fit the individual job. When positioned they are bolted solid to the rails.

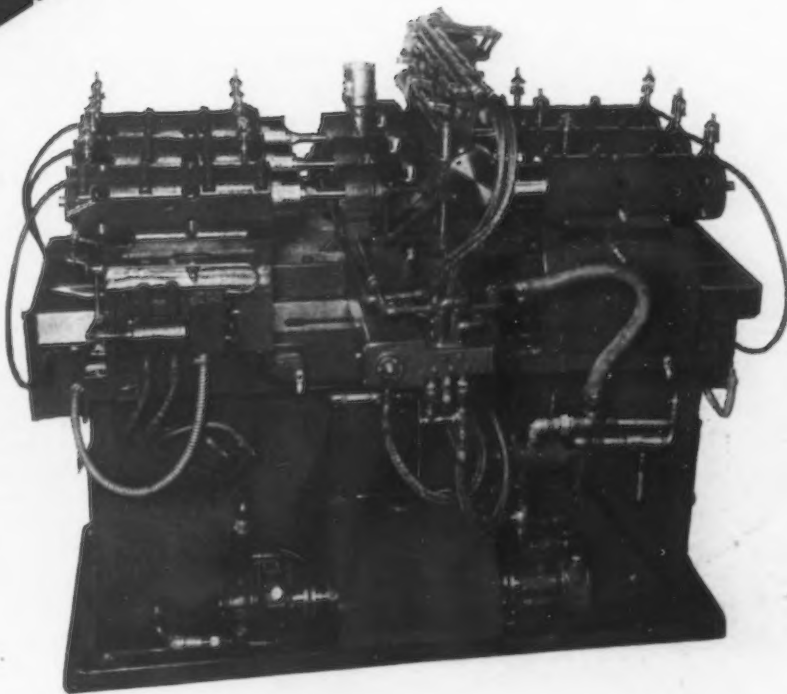
The bridges upon which the boring heads are mounted are the U-construction spanning the machine table. The top surfaces are accurately scraped. Two T-slots extending crosswise are provided for holding the boring spindle units rigidly in place. The spindles can be easily adjusted. Each boring spindle is driven by a $\frac{3}{4}$ -hp.



THREE pistons are rough and finish bored simultaneously. Arrangement of spindles, three roughing and three finishing, may be seen in rear view below. Either diamond or tungsten-carbide tools may be used

the machine proper, holds the pistons.

Rough and finish boring with a single loading is stressed as eliminating a rough boring machine, one handling and an operator; in addition, it assures leaving a minimum amount of stock for removal in the finishing operation, and the stock left is concentrically distributed. Finish boring with the work being bored at one end of the machine while new work is loaded at the other end, may also be done. With suitable fixtures, equipment and rearrangement of set up, the machine will handle motor and generator end-frames, cluster gears, interchangeable main bearings and similar work. At the completion of the operating cycle the fixture stops in the middle of the machine. By turning the hydraulic control crank, at the front, the hinged cover that carries the clamping mechanism is opened automatically, and the pistons are partially ejected from their seats. When new pistons are placed in the fixture



3600-r.p.m. built-in motor; with this arrangement spare spindles with their boring tools set to size may be interchanged quickly. There are no belts, chains or gears in the machine other than the oil and coolant pumps which are gear pumps directly driven by one 2-hp. ball-bearing inclosed motor. The oil pump, which has ball bearings and spiral gears, and the coolant pump, are said to have been developed for this application. The hydraulic system and valves were specially developed by the company.

With the full hydraulic operation speeds and feeds can be changed quickly. By relocating the fast speed, slow speed and table reversing dogs on

their mounting bar, any operating program can be obtained. This type of adjustment is simple, accurate and eliminates the cost of cams. By means of the conveniently-located manual control valve, the machine may be stopped at any point without disturbing the automatic cycle.

The spindles on each bridge are equipped with limit switches and individual brakes that are operated hydraulically. When the cut is completed and the table is ready to reverse, the limit switch is disconnected and the brakes applied, stopping the spindle, while the work returns and the cutting tool is backed out of the work.

contact with the pattern. This causes the milling machine cutter to produce the same shape in the die block.

Accuracy of the operation is controlled by means of a visible station which signals to the operator the direction or directions in which to feed the table in order to duplicate or transcribe from the pattern to the work. For example, when the operator has gone deep enough, the center signal light goes out; when he has gone far enough to the right, the right hand light goes out, and so on. This signal system is of simple design and eliminates the necessity for using depth, radius and other gages.

One plaster mold may be used in making 45 or 50 dies; for larger quantities the first die made should be used as a guide in making the others. This transcribing instrument can also be adapted for use on milling machines having heads that move vertically. On such installations the base is discarded and the instrument is mounted on the vertical head. Specifications include: Center of instrument to center of column, 14 in. minimum and 38½ in. maximum; bottom of instrument chuck to floor, 32½ in. minimum and 61 in. maximum; floor space required, 32 x 43 in.; and net weight, 2500 lb.

Transcribing Instrument for Use with Vertical Milling Machines

FOR profiling work, the Walcott Machine Co., Jackson, Mich, is offering the transcribing instrument here illustrated, which, used with vertical milling machines, is featured as providing die sinking equipment at comparatively low cost. Simplicity, accuracy and rapid operation are some of the claims made.

Mounted on ball-bearing casters, the instrument can be rolled from one milling machine to another, after releasing the corner leveling screws. Its use does not interfere in any way with the regular operation of the milling machine.

In making dies or metal molds by this method, a plaster mold of the form to be cut in the die block is placed on the table of the milling machine at the left side of the spindle,

and then lined up with the die block by means of pointers inserted in the transcribing instrument and in the head of the milling machine. With the work thus centered, a cutting tool is inserted in the head of the milling machine and a "follow-button" corresponding to the form of cutting tool is mounted in the head of the instrument. The table of the milling machine is adjusted so that the cutting tool is about 0.004 in. above the face of the die block; the arm of the instrument is then lowered so that the "follow-button" just touches the top face of the plaster mold.

The operator is now ready to transcribe the form of the mold in the face of the die block. He feeds the table of the milling machine so that the transcriber "follow-button" comes in

No Oil or Compound in New Switchgear

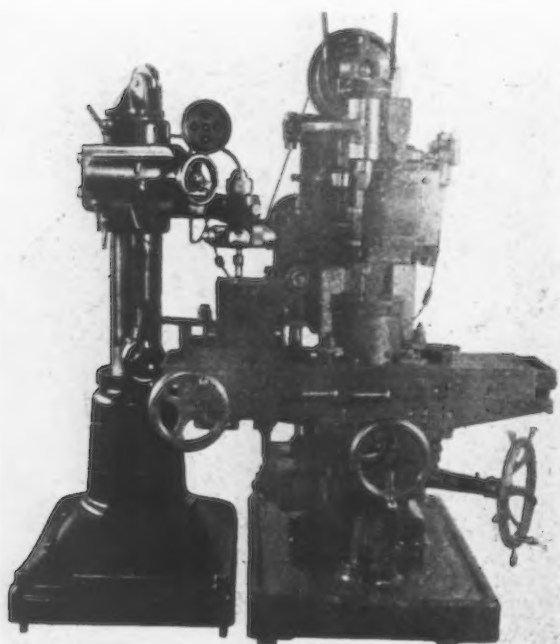
IMPROVEMENTS in design characterize a line of unfilled metal clad switchgear made by the General Electric Co. This switchgear is known as "unfilled" because, except for the oil circuit breakers, it does not contain oil or compound. This type of gear is furnished with oil circuit breakers having current ratings up to 2000 amp. at 15,000 volts and 3000 amp. at 7500 volts. Interrupting ratings of from 100,000 to 400,000 kva. are available.

New Gear Lubricants

A NEW series of gear lubricants for all types of heavy, slow-moving, open gears has been placed on the market by E. F. Houghton & Co., Philadelphia. There are four different grades, designated as the Tenac Nos. 1, 2, 3 and 4, the No. 1 being the heaviest and the No. 4 the lightest of the series.

It is claimed that the lubricant will not be thrown off the gears while they are in motion. An advantage also stressed is the low cold test, it being said that the Tenac No. 3 and No. 4, for example, can operate satisfactorily at 20 to 25 deg. lower temperature than usual. No special device or method of application is required, the lubricant being applied to the gears in the usual manner.

Pitt Iron Mining Co., a subsidiary of the Wheeling Steel Corp., has changed its address from Virginia, Minn., to Mountain Iron, Minn.



USED with vertical milling machines, the transcribing instrument performs die sinking operations rapidly. A plaster mold of the form to be cut is mounted on the table of the miller and then lined up with the die block, as explained in the article

Develops Welded Joint for Double Length Pipe

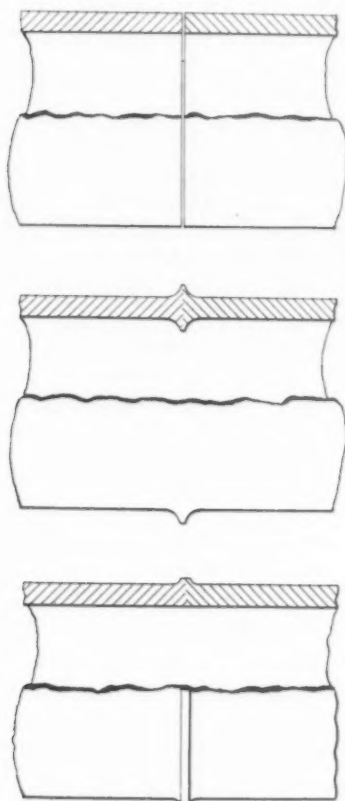
FOLLOWING exhaustive research, the Jones & Laughlin Steel Corporation, Pittsburgh, has developed and is now using exclusively an improved type of welded joint on all J & L double-length line pipe in sizes from 1 in. to 12 in., inclusive, to meet the increasing demand for oil and gas line pipe in double-mill lengths.

The new process employed is an adaptation of flash welding. By this method of joining steel, the parent metal in the parts to be joined is electrically heated to the point of fusing

In the flash welding process the pipes to be joined are butted together. Heavy electrical contacts are clamped around each pipe close to the abutting ends. Electric current of high amperage is transmitted between these contacts through the joint until the ends become molten hot. At this stage applied pressure squeezes the molten metal from the joint, as well as any oxide that forms during the welding operation and at the same time unites the pipes in a manner similar to forging. The exuded metal

fications. On the outer circumference of the joint, the oxide is removed, leaving only a small dense pad of metal. The pipe is finally subjected to inspection and hydrostatic test.

In the flash welding process the weld is made at the proper temperature, the application of heat being controlled and varied with the material to be joined. Oxidation and decarburization are practically eliminated, as are strains due to uneven contraction and expansion, for the two lengths of pipe are heated over the entire ends simultaneously. Any blow holes which might tend to form, or any oxide which is produced, are pushed out of the weld by the forging action taking place as the two lengths of pipe are pressed together.

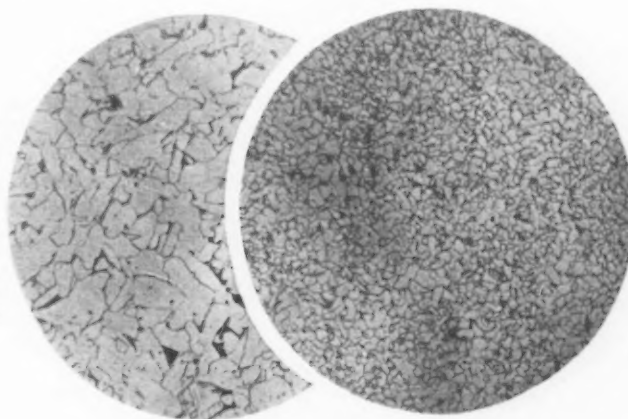


THE drawings show the ends of the pipe butting against each other at the start of the welding, the amount of upsetting after welding and the welded pipe after trimming

under pressure. No foreign material is required to form a bond. The result is a single, homogeneous pipe of the combined lengths of the two parts joined.

When this corporation began the production of double length welded pipe, about two years ago, it employed the acetylene welding process that was in general use in the industry at that time. However, shortly thereafter, the company's operating officials began studies and experiments revolving about the dictum that the best joint between two pieces of metal is secured by forging. The efforts culminated in the adaptation of the electrical process of flash welding, as giving the desired forging characteristics.

PHOTOMICROGRAPH of the metal in the weld of the double length pipe formed by the J. & L. flash welding process is shown superposed on a photomicrograph of the parent metal of the pipe



gathers as beads on the inner and outer surface of the joint with the oxide forming a coating on top of the metal. The oxide coating and the bead on the inside are sufficiently removed to permit drifting according to American Petroleum Institute speci-

The micrographs attached show the grain structure produced by the flash welding method now employed by J & L. The equipment used in the J & L adaptation of the flash welding process is of special design and has been installed at a considerable cost.

New Steel Mill Equipment to Cost 50 to 75 Millions

Expenditure of between \$50,000,000 and \$75,000,000 by the large steel companies of the United States for new mill equipment is more or less definite, according to George T. Ladd, president, United Engineering & Foundry Co., Pittsburgh, maker of rolls and rolling mill equipment.

In addition to this large sum, plans which are still in the nebulous state provide for further expenditures, he indicated.

The current state of general business is adding to the early prospect of steel company expenditures for equipment rather than detracting from it, the United Engineering head said, because in nearly all cases the new mills will supplant those now in use.

"The steel companies today are not interested in expansion to nearly the extent they are in reduction of costs," Mr. Ladd said. "The development of striking improvements in rolling mill machinery within the past two years and the installation of some of this

new type of equipment has brought about a difference in costs of production which makes it necessary for other steel companies to order similar installations as soon as possible.

"With the present low price of finished steel products, the cost of steel output is more important than at probably any previous period in the history of the industry. Upon the type of equipment in the mills depends, to a large extent, the difference between a profit and loss.

"Some steel companies are still operating mills installed 20 and 30 years ago. The costs at these mills cannot even approach those of more modern units, and every person in the steel industry knows it.

"The processes of modern development are so rapid that even today each piece of complete new equipment we turn out contains some improvement over the last previous one installed.

"We have had an excellent year in our machinery department and our estimating force continues very busy figuring on new projects."

Pipe Company Opens New Research Laboratory

CONVINCED that there are many things yet to be learned about the cast iron pipe business and its allied products—particularly the metallurgy of the subject—the directors of the United States Pipe & Foundry Co. decided to establish a research department. They were influenced by a belief that research, properly directed and carried out, is a profitable investment. In handling metal by both the sand mold and the centrifugal mold processes, there are numerous complicated problems, along with opportunities for improvement. One needs only recall the radical changes which the company has made in the deLavaud centrifugal pipe process since its introduction into this country about 15 years ago.

In locating the new research department, which was planned to concentrate all of the research of a general nature that had long been an activity of the company, the Burlington (N. J.) plant was selected. An attractive building was erected adjoining the company's main office, designed to harmonize with the architecture of the older building. Its surroundings are ideal—in front, flowers and shrub-

bery; in the rear, a lawn sloping down to the Delaware River.

Dr. Langenberg Is Director

To head this new addition to American industrial research facilities, the company selected Dr. F. C. Langenberg, an American metallurgist whose work in the steel industry, particularly alloy steels, has brought him wide recognition. Investigations at the Watertown Arsenal, both in centrifugal casting developments and in other metallurgical work, stand prominently among his achievements. Previous to his present connection, he was vice-president of the Climax Molybdenum Co., New York. Associated with him is C. D. Mathews, for many years active in the metallurgical end of the cast iron pipe industry.

The laboratory has been equipped so that almost any kind of research work in metallurgy or in sand can be undertaken. Some features are as follows:

In the metallographic laboratories there is equipment for examining the structure of metals up to several thousand diameters magnification as well as accessories for rapid work, includ-



DR. F. C. LANGENBERG

ing photographic printing machines, drying and washing machines to enable the preparation of photomicrographic prints quickly and economically. The department includes modern developing and printing rooms.

Research in Sand and Cement a Feature

Sand problems are an important feature of the operations of a pipe foundry, even one that has a large output of centrifugal pipe. One department of the laboratory is devoted to research problems in cement and in sand testing. Cement problems include the question of the proper lining of centrifugal pipe with cement coatings in order to prevent tuberculation in certain waters. Work is in progress to develop better cement coatings so as to entirely eliminate free lime. In the sand-testing department the most modern equipment is available for determining moisture in sand in a period of 2 to 4 min. by means of electrical and air currents passing through a sand core, moisture being driven from the core and the amount registered by a pointer on the index chart. Apparatus for determining the strength and permeability of both dry and green sand cores is included.

Many Testing Machines and Tools

One of the most interesting departments is the physical laboratory, where there is an assortment of testing machines, as follows: A 50,000-lb. Amsler universal testing machine, a Tinius Olsen Izod impact testing machine, a 1-in. ring impact tester, an Olsen-Boyd automatic cement tester of 2000-lb. capacity, an Olsen direct motor-driven hydraulic Brinell hardness tester, a Rockwell hardness tester, and a Shore scleroscope hardness tester.

Besides these there are two electric furnaces in that department: A 25-kw. Hoskins electric furnace with automatic temperature control and a 5-kw. Hoskins electric furnace with manual control.

There are six machine tools in this
(Concluded on page 1434)



The New Research Laboratory Adjoins Main Office

Industrial Recovery Waits on Price Upturn

BY LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

ONE of the most disappointing turns of the wheel of business fortune of late has been the resumption of a downward trend in the prices of basic commodities. Some indications of stabilization had appeared in early September and late October, when a number of important commodities made recoveries, but in several cases reactions have followed rallies (e.g., silk, cotton, wheat) and the indexes of basic commodity prices still point downward.

Unquestionably, the Bradstreet index of commodity prices has been giving a true picture of the general trend. On Nov. 1 this index was 2.4 per cent lower than on Oct. 1, and stood at a new low level. This is 30 per cent below the peak in December, 1925, and 5.2 per cent below the lowest point reached in 1921. The chief declines occurred in metals, hides, leather and provisions.

Four-to-One Ratio in Prices

In the past, THE IRON AGE index of finished steel prices, put on a per ton basis, has averaged just about four times the Bradstreet index. The latter index on Nov. 1 was \$10.0573, and four times that amount is \$40.23. The finished steel average is \$47.82 a ton. To the extent of this difference, amounting to \$7.59, it is reasonable to say that finished steel prices average higher than usual with relation to the general level of commodity prices.

In February, 1922, which was the lowest point in steel prices, the steel index was \$44.96 and the Bradstreet index (x4), \$45.68. The Bradstreet index in June, 1921, however, had been as low as \$42.47, or \$2.49 under the subsequent low for steel prices.

Must Steel Fall Still Lower?

Should we assume that the Bradstreet index is now at its low point, and that steel prices are to fall as low in comparison therewith as in February, 1922, it could be said that the average price of finished steel, as measured by THE IRON AGE composite, may still have to fall about \$5 a ton. Nails and sheets are \$7 to \$10 a ton under their low levels

of 1922 but this is not so in the case of other forms of steel.

All this is highly abstract, and it may well be that differences in the present situation may give rise to different results and relationships. Certainly, most steel prices are already too low to allow much, if any, profit to the producer. Nevertheless, the following facts should be noted:

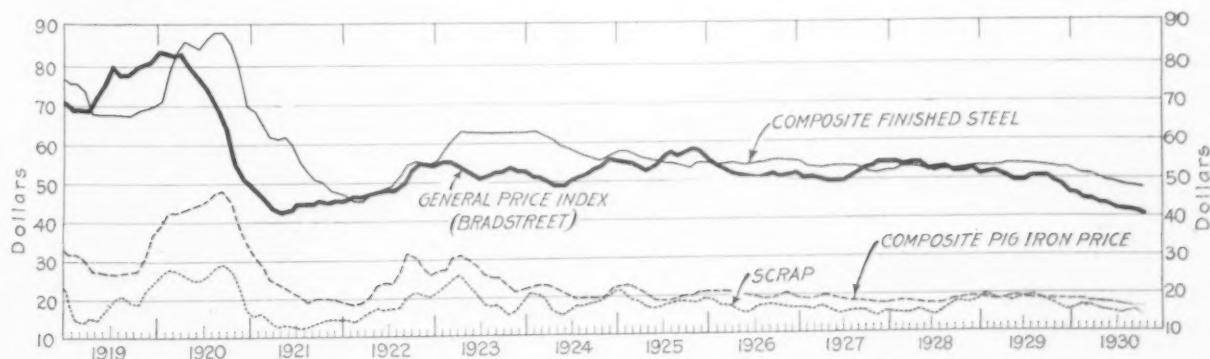
1. The price of coke is now lower than in 1921.
2. Pig iron is nearly \$2 under the low point of 1922, and heavy melting steel scrap is a little lower.
3. Production of steel ingots is 36 per cent below "normal" (computed long-time trend), against 41 per cent at the 1924 low point and 66 per cent in 1921.
4. Sales of several chief items of finished steel (tons) in September were probably the lowest for that month since 1921.

Buyers of steel will remember that usually the lowest prices for that commodity are not seen until after production begins to expand. It would not be surprising if efforts to maintain prices now would make the usual outcome doubly sure later on.

Large Liquidation of Stocks Needed

Looking at the price situation broadly, the outstanding fact at present is the necessity of maintaining many markets at a level sufficiently low to allow the liquidation of large accumulations in storage. Copper, zinc, oil, sugar, silk and cotton are but a few instances. Under such circumstances, the cost of production has no immediate significance. The only question is, what price will induce "investment" buying?

Much the same situation exists in the stock market, where an extraordinarily large volume of security loans is evidence of the great supply that is potentially for sale. The quicker holders of excess stocks of raw materials, manufactured goods, securities (and to some extent labor) accept readjusted values—which for some time yet must be on a liquidating basis—the sooner will "investors" take hold.



Spread between Bradstreet prices and finished steel is greater than usual

The Iron Age, November 13, 1930—1399

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

Wage Rates and Services

IN its latest circular the First National Bank of Boston suggests that "the natural economic forces must be permitted to run their course" and that artificial measures will do harm in the long run. Its reference to this matter winds up with the statement: "Depression stimulates clear thinking and the adoption of constructive measures for the elimination of wasteful practices."

That is sound doctrine and we are disposed to apply it to the matter of wage rates and the service rendered by the respective wage recipients. Surely the first case that will come to mind with the majority of men is the high cost of building, particularly in dwelling house construction. As long as people have plenty of money and feel they must have things, they will pay the price, either ignoring the point of *quid pro quo* entirely or simply deciding they must take their medicine. Just after the war there was the great housing shortage. It was thought by many that the shortage could not be made up at the existing high costs and accordingly building trades artisans were urged to accept lower wages and to work harder. The workers could not see it that way and for several years they had the upper hand, the shortage being a pressing one.

Now the situation is not so pressing. There is plenty of shelter to accommodate, in a way, all the people. There remains a lack of modern homes, decent and suitable. Many buildings are being used that ought to be torn down and replaced.

Of late there has been clear thinking. People compare what they get in buying automobiles and various other things with what they get in buying or building a house. Those with money to lend see the same thing and will not lend it unless the prospective owner puts up a large equity, to insure against a large decrease in the cost of building which is held to be distinctly possible if not indeed inevitable.

During the last few years there have been very extensive readjustments in relative prices of commodities at wholesale. Economic laws have been working out along the line of demand and supply and there has been pressure in varying degrees upon production and distribution costs. Dwelling house construction has not been subject to these shaking out processes. There are several reasons, the most important of which is that there is in essence a different buyer each time. It is worth nobody's while to draw an issue and make a contest, until now there is the mass influence which must be recognized.

Observe the contrast with the successful manufacturer buying his materials and tools. He knows about what it costs to produce the things he buys. He in-

sists on a price in keeping and if the cost seems high and cannot be reduced he very often develops a substitute. In the case of dwelling houses the substitute with a large part of the population is living in antiquated structures and spending money on something else. Given reasonable and proper construction costs money will be found somehow and there will be much more building.

We do not wish to represent that this is the only thing that needs to be shaken out and adjusted. There have been various cases of overproduction in connection with which the charge of underconsumption cannot be made, but there are other things in which it is a case of underconsumption because the price is not right for these times.

Relieving Unemployment

ELECTRIFICATION of the railways entering Boston, at least in the suburban zone, has long been under consideration. The Governor of the State recently intimated to them that in view of the present cheapness of materials and abundance of labor available at low rates (perhaps) this would be a good time to undertake the job. The railways, which are but just emerging from financial difficulties, inquired politely as to whence would come the necessary credit, suggesting that while they might like to have a physical improvement they feared they ought not to afford it.

A good deal of sound economics is here offered in a small packet. Cheap conditions of construction should inspire the provision of new and improved facilities, if needed, and such an institution of new work should extinguish depression and unemployment. In order to vitalize such a movement there must be either the possession of credit or the ability to get it. Now, although money is quoted at a very low rate, long-time credits, meaning terms for bond issues, are not so.

But a State desirous of providing employment for its citizens, and looking to the railways to contribute, might become a real agent by (a) guaranteeing the bonds of the railway company for the purpose of some major improvement; and (b) agreeing to amelioration of soaking the railways for taxes.

Probably no State government would venture to announce such a policy. Even if it should there would immediately arise the questions whether the State would insist upon the use of hand shovels instead of steam shovels; and whether, while common labor may now be hired for 25c. an hour, would unionized mechanics accept anything less than \$1.50, or what kind of a trade might be made with them;

and finally, what about the six-hour day that the brotherhoods are contemplating?

A municipality in a western State is relieving unemployment by sequestering the steam shovels on a job of excavation and substituting men with picks, shovels and wheelbarrows. The conception is humane, but in its economics it is woozy. The work becomes more costly and the taxpayers foot the bills, wherefore the only difference between this and the direct tender of a dole is in the preservation of the selfrespect of the human diggers in the thought that they are working rather than being the recipients of charity. Socially that may be of real importance. At all events it is an antidote to bolshevism and as such it may be well worth the cost.

Steel Output Reaching a Minimum

STEEL production appears to have followed an erratic course month by month this year. But when certain allowances are made, smoothing out the production line, there is seen to be some system. The first departure from an orderly course was that production declined from February to March, leaving February as the high month of the year, when in previous years of ordinary movement March, or occasionally a somewhat later month, has been high. In the confused thought that followed the collapse of the stock market many held the opinion that 1930 would be one of gradual although slow recovery. The next departure was the exceptionally large drop from June to July. When this was followed by a slight increase for August it looked as if seasonal improvement had begun, but losses were then resumed.

First the actual figures will be presented, giving the appearance of an erratic movement, and then comment will be made to indicate that the movement at longer range was not so erratic. The matter is of importance, because it should throw light on what may be expected in the next few months.

Daily Rates Steel Ingot Production

	Daily Rate	Change, Tons	Change, Per Cent
January	140,596	.....	.....
February	169,930	+29,334	+20.8
March	165,381	-4,549	-2.7
April	159,764	-5,617	-3.4
May	149,066	-10,698	-6.7
June	137,610	-11,456	-7.7
July	112,823	-24,787	-18.0
August	119,050	+6,227	+5.5
September	110,307	-8,743	-7.3
October	100,756	-9,551	-8.7

If a certain amount of tonnage is taken from August and put back into July the two months combined would simply show slightly greater losses than preceding or following months, representing the traditional "summer dullness." That is not doing much violence to the figures, and then we should have it that there has been a continuous decline since February.

With this longer-range view, the remarkable thing is that the decrease has tended to be progressive. Roughly speaking, the monthly tonnage losses are about the same, but when a given loss is from a progressively decreasing output, the loss computed in percentage becomes progressively greater.

Obviously that is not something that can continue

for any great while. Continued percentage decreases are conceivable, but they would result in smaller and smaller losses in actual tons. The industry is headed for a low year-end rate, and by that very same token the opportunity for an upward rebound in January is made the greater, and that would be strictly in accordance with precedent. It is a seasonal fluctuation, and seasonal fluctuations occur in poor times much the same as in good times, being prevented from showing themselves only by general trade conditions being engaged in growing poorer or better. Presumably they are already approximately as poor as they are likely to be.

China and Silver

THE political disturbance of China has had so adverse an effect upon the economic affairs of the rest of the world and has been such an aggravation of the existing depression that the suggestion has been made seriously that the United States of America should undertake to put that country in order, by *force majeure*, in the interest of the whole world. We did something of that sort in Cuba, but our people have no longer any urge toward external military operations.

Now there comes to us an envoy from the President of China with the request that we lend to that country a billion ounces of silver to be repaid in 50 years, with interest at the rate of 2 per cent annually on \$360,000,000. With this bullion the unemployed of China would be put to work, first in building roads, then in providing more food, and finally in other developments, which by reducing pauperism and despair would stave off bolshevism and create markets for American goods.

There is much sound economics in this conception, but there are conditions that obviously require careful examination. If the Chinese people want silver and are willing to exchange their labor for it that is their own affair. We have the silver in our national warehouse and it is of no use to us. If its transfer to China would lead the Chinese to buy from us commodities and machines we could almost afford to give it to them gratuitously.

There are, however, already great stocks of silver in Shanghai and Bombay. It was the initiation of liquidation of the Indian horde that precipitated the decline in the value of silver. The American accumulation has been immobilized, so to speak, i. e., it merely exists without being for sale. What might be the effect upon the silver market of turning this loose?

Another question relates to the sentimental affection for silver that lingers in the breasts of Rocky Mountain politicians, although the picturesque silver miner disappeared not long after the Indian and the bison; and the populist remembrance of an alleged crucifixion of agrarian people upon a cross of gold. We got rid of our useless silver during the great war, but political demands required us to replace it, and no doubt we should have to agree to do that again.

We feel sure that, if the Chinese were granted a suitable credit with which to provide themselves with food and materials, wherewith to increase the development of their country, there would quickly be an

amelioration of unrest and disorder and that would be in the interest of China and all the rest of the world; but we doubt if a silver loan would accomplish that. The Chinaman who exchanged a day's labor for a piece of silver would want to exchange that for something that he could eat, for the mass of the people in China are too poor to absorb silver to hoard; which doubtless explains the continuance of the large stock of silver in Shanghai.

ON Nov. 10, 1927, the Carnegie Steel Co. advanced prices. On Monday of this week, precisely three years later, the same company announced minimum prices. In our editorial of last week having to do with "Steel's Course Three Years Ago," our observations were more timely than we realized. We may ardently hope that betterment will follow as it did in late 1927. For several weeks our editorials and the utterances of business leaders have fairly bristled with calls for stabilization. The dominating position of the Carnegie company should serve, if anything now will, for the stiffening for which everyone is looking. The low state of profits, or more correctly, their disappearance, makes the action popular all up and down the line.

CORRESPONDENCE

Three-Day Weeks

To the Editor: The article by Ralph E. Flanders in your issue of Oct. 30 is on a very important subject and it seems to me that my old friend, Mr. Flanders, is very much in the wrong in thinking that such a condition can ever make a successful business or a successful country.

If his company could turn out in three days as many machines and tools as they now do in an entire week, then they could afford to pay the employees the same amount, but by no stretch of imagination can any one conceive of this being accomplished.

Therefore, a "Three-Day Week" would mean either less compensation to the employees or a higher cost to the product, and neither of these tend to prosperity.

While there may be an over-production of food stuffs, so far as our own consumption is concerned, there are millions of people in other lands—especially in India—where the people never have enough to eat. If ways and means could be devised by which the farmer could be paid for the wheat and this sent to the lands of starvation, both parties would be helped. With the conditions as mentioned above, neither the employer nor the employee can furnish the money to pay for the wheat.

The comforts and luxuries which we all enjoy are so vastly beyond those of our fathers that we live almost as well as kings did in a century gone by and this condition is brought about by improved facilities and machines.

Almost everybody in the land would be glad to have many more of the good things of this world and there are enough automobiles on the street which are disreputable looking and even dangerous so that replacement would keep the automobile factories busy. Lack of funds and lack of certainty of more funds coming in prevent their users from purchasing new cars.

These cars are only made possible within our reach because of labor-saving devices, and the more labor-saving devices we have, the more comforts and luxuries of civil-

ization can be enjoyed by all, but not with the shorter day or shorter week.

In fact, I doubt very much if the shorter day or shorter week would really be pleasing to us, for we are happier in working, and doubtless Mr. Flanders receives more pleasure in the accomplishing of the many things on which he is working than he would if he spent half his time loafing or pleasure-seeking.

Rochester, N. Y.

W. S. DAVENPORT,
President and General Manager,
Davenport Machine Tool Co.

The Steel Outlook

To the Editor: It would be extremely difficult to make out a case for estimates of steel ingot production at a rate averaging more than 50 per cent of capacity for the fourth quarter of 1930. Likewise, it would be difficult to make out a case for an average rate lower than 45 per cent. These estimates are made from potential capacity as of the beginning of 1930. If they were to be made from potential capacity as subsequently increased by new equipment, they would lower the above estimates by about three points.

This range, from 45 to 50 per cent of ingot capacity, is not a range for absolute high and low weeks of the fourth quarter. It is a range of averages for the whole quarter. If we were to think of high and low weeks within the quarter, we would probably assume a low week some time in November or December, perhaps near 40 per cent. With less conviction, but as a distinct possibility, we would assume that the best week in December would be slightly above the worst week of November. This is significant as a possible factor in a year-end up-wave of business sentiment.

The most reasonable further assumption is that between the low week of the fourth quarter of 1930 and the high week of the first quarter of 1931, a distinctly visible margin of improvement is likely. A present guess would be a high week of perhaps 60 per cent of capacity some time in the first quarter of next year, probably in March. This assumption is highly important, for if correct it means that a visible influence will be at work some time during the first quarter of 1931 toward a more hopeful business psychology all along the line.

How much importance one will attach to such views depends upon one's valuation of the methods used in reaching them. What I have done is to break down steel consumption into its various lines, such as railroads, automobiles, construction, etc. In turn, I have broken down each of these groups into a number of more detailed series. Thus, in estimating the construction industry demand for steel, I have had to estimate the various sub-classifications of building contracts, and to check these against the curve of engineering awards and of building permits. When all such sub-series of all groups are put together in one grand total of steel demand, one has a composite derived from more than 100 individual economic lines. This sounds quite complex, but if one has a little patience and ingenuity, it can be worked out quite simply. I have found it exceedingly helpful as a means of forecasting general business, because it gets away from the glittering generalities about easy money or trade recovery and sets up an independent estimate based upon fairly specific information about individual lines.

This estimate for what we may legitimately hope to be the bottom quarter of the depression compares with about 31 per cent hit in the bottom quarter of 1921 and of about 62 per cent in that of 1924.

LIONEL D. EDIE.
Economist, Investment Research Corporation.
Detroit.

Leading Interest Takes Price Stand on Plates, Shapes and Bars

▲ ▲ ▲
MINIMUM Quotations of
1.60c., Pittsburgh, Are
Named — Radiator Company
Buys 50,000 Tons of Pig Iron—
Steel Output Down
▼ ▼ ▼

WITH the immediate outlook unimproved, the iron and steel trade is banking on an upturn in January. Precedent points to some measure of recovery at that time just as it offers little hope of a change in trend in the remaining weeks of 1930.

It was undoubtedly with an eye to the first quarter of next year that the foremost steel interest took the initiative this week in an effort to stabilize prices on plates, shapes and bars. The naming of minimum quotations of 1.60c., Pittsburgh, was the first formal price announcement to be made in nearly two years by a leading maker of heavy steel products. The prices represent neither a reduction nor an advance, but are calculated to stiffen the resistance of producers to concessions, which have been most frequent on large tonnages of plates and shapes going into structural fabricating projects.

Coming close on the heels of disappointing third-quarter financial statements and during a period when diminishing operations and mounting costs make an ever poorer quarterly showing inevitable, the announcement was well timed. Sponsored by the largest interest, it added strength to the view that prices are finally scraping bottom and that a successful stand can be taken at present market levels in negotiating contracts for the next quarter.

While scrap prices and steel production have undergone further declines, these developments are discounted on the basis that seasonal influences, accentuated by conservative business sentiment, are at work. Consumer stocks, already depressed, are being further reduced and on Jan. 1 are expected to be the lowest in many years. The drastic character of the deflation of inventories is counted on to add force to the rebound in demand early in 1931.

Although there is little indication of recovery among consuming outlets for iron and steel, the mere relaxation of pressure on stocks, plus even a subnormal manifestation of seasonal factors, would have important aggregate effects, it is reasoned.

Evidence of rising confidence is found also in the pig iron market. The purchase of 50,000 tons of iron by the American Radiator Co., the largest order in many months and particularly conspicuous at the present time, with buying interest at a low ebb, indicates at once a belief that prices are thoroughly deflated and that building operations are headed for improvement. The move is of particular interest at this juncture because its sponsor has frequently been the bellwether of the foundry trade in the past.

Steel ingot production has declined from 48 to 44

per cent of capacity. Chicago output has receded to 45 per cent, compared with 50 per cent a week ago; Pittsburgh operations have fallen below 50 per cent and in the Valleys not more than 40 per cent of capacity is engaged. The only producing center to report a gain is Cleveland, where output has risen to 32 per cent from the very low rate of 20 per cent.

Scrap markets remain inactive and weak, with heavy melting grade down 50c. a ton at Pittsburgh and Chicago and \$1 a ton at Buffalo. THE IRON AGE composite price for heavy melting scrap has reached a new low of \$11.58 a gross ton, compared with \$11.92 last week and \$15 a year ago.

Old material forecasts no early improvement in the iron and steel trade, but immediate betterment is not looked for, particularly in view of the fact that many of the new demands now coming into the market cannot affect production until next year. This week is again noteworthy for a large amount of prospective structural steel work—62,000 tons—while awards, at 35,000 tons, remain of average proportions. Many of the construction undertakings now being figured on are public projects, representing a fruition of efforts to get large Federal, State and municipal programs started. Similarly prospective rail business is in growing volume, with orders impending from the Milwaukee, Illinois Central, Rock Island, Erie, Pennsylvania and New York Central, but releases for rolling will probably fall mainly in the new year.

The recent revival of demand for railroad equipment has been slow in gathering momentum, but some of the steel tonnage required for car construction recently undertaken has reached the mills. The Pennsylvania has bought 24,000 tons of steel for the building of 1500 gondola cars. The Virginia Bridge & Iron Works has placed 6500 tons of plates and shapes for 600 coal cars to be constructed for the Virginian Railway. The only new inquiry for equipment is one for 800 cars issued by the Chicago & Illinois Midland.

A large producer has revised width and length extras on black sheets, changing the divisions of the gages and in certain instances reducing the width extras by about one-half.

Steel companies' efforts to sustain buying power among their own employees by rotating jobs have been supplemented by the launching of plans to help those for whom no work can be provided. The Inland Steel Co. and its active employees have created a relief fund for distribution among the unavoidably idle, and the Youngstown Sheet & Tube Co. has devised a plan of granting credit to needy workers at company stores.

PITTSBURGH

Carnegie Steel Co. Starts Move Toward Steel Price Stabilization

PITTSBURGH, Nov. 11.—While the first third of the month has brought no improvement to Pittsburgh district steel companies in the way of new business or tonnage releases, the move on the part of the leading producer of heavy hot-rolled products to stabilize prices at recently quoted levels is considered a highly constructive development.

The Carnegie Steel Co.'s announcement on Nov. 10 that bars, plates and shapes will hereafter be quoted at a minimum of 1.60c., Pittsburgh, on all new business is the first formal price announcement to be made in nearly two years by a leading maker of heavy steel products. While this figure does not represent a change in the commonly accepted prices on current tonnage, it amounts to an advance on plates and shapes and brings bars to the same level. Leading independent companies are instructing their sales offices to adhere to the same prices.

The price situation on other steel products continues rather weak, but if attempts at stabilization are successful on the heavy tonnage items the way would be paved for advances over the entire range of rolled products. While increases could hardly be expected to hold in such a dull market, it would perhaps be possible to maintain present quotations on first quarter business which otherwise might be shaded to drive in contracts at the year end. Third quarter financial statements of leading steel companies were almost unanimous in pointing to the lack of profit in tonnage at recent levels, and the industry is driven by sheer self preservation to take a firmer stand.

Specifications in the last week or two are even lighter than they were in October, and the trend of operations in both open-hearth plants and rolling mills is still downward.

Ingot operations in this district have fallen under 50 per cent of theoretical capacity, and in the Valleys not more than 40 per cent of the available steel-making capacity is engaged. While the placing of considerable railroad tonnage in the next few weeks will aid materially in maintaining production, little tonnage is in sight from other sources, and it is unlikely that a further gradual curtailment in output will be checked before the end of the year.

Precedent promises a limited upturn in January, but the extent and duration of such improvement is the unknown quantity which steel makers would like to know most just now. With consumer inventories very low, no large reduction will be necessary next month, and orders placed after

Move to stabilize price of bars, shapes and plates viewed as constructive development.

* * *

Specifications for steel are lighter than a week ago, and trend of operations is still downward.

* * *

Average ingot output in immediate Pittsburgh district is now under 50 per cent, and is not more than 40 per cent in Valleys.

* * *

Railroad tonnage soon to be placed will aid production schedules, but little business is in sight from other sources.

* * *

Scrap prices decline further. Heavy melting steel at an average of \$13.25.

Jan. 1 will go immediately into consumption.

Business uncertainty, provoked by the election and the steady decline of stock prices, is blamed for the dullness in the steel market since the first of the month. Consumers show no interest whatever in future requirements, and are turning their attention from the concrete evidences of depressed trade to watch the results of governmental and private attempts to restore buying power. While this attitude in itself is not conducive to general improvement, it is giving the larger steel-making and steel-consuming industries an opportunity to contribute their individual shares to the process of bringing business back to normal. Most of the steel companies are trying to alleviate unemployment by maintaining limited operations at all plants, and the opportunity offered by light production to make repairs and replacements is being liberally utilized.

The market on raw materials shows further weakness. Pig iron prices are unchanged in a sluggish market, but scrap has declined 50c. to \$1 throughout the list, and furnace coke is quotably lower.

Pig Iron

Shipments this month are holding close to the October average, and hand-to-mouth buying persists. No general inquiry is before the trade, and sales of small lots are being made regularly with a minimum of solicitation. Recent nominal prices are holding, with no considerable tonnage in the market which might offer a

test of current figures. The Shenango Furnace Co. has lighted one of its stacks, but the resumption is prompted principally by the hot metal requirements of a nearby mold foundry. This furnace is now the only active merchant stack in the Pittsburgh or Valley districts, and steel company furnace activity is at a minimum.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$17.00
Bessemer	17.50
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.50
Low phos., copper free	\$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	\$17.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	18.00
Bessemer	18.00

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

Semi-Finished Steel

With scarcely any new buying reported, the market on billets, slabs and sheet bars is nominally unchanged at \$31, Pittsburgh. Shipments to non-integrated sheet and strip producers are very limited, while makers of tin plate depending upon outside sources for their raw steel have curtailed their requirements sharply.

Bars, Plates and Shapes

The Carnegie Steel Co. on Nov. 10 announced a minimum price of 1.60c., Pittsburgh, on bars, plates and shapes, effective immediately. On plates and shapes, this recognized a nominal market which has been quoted for some time, but which has been freely shaded, particularly on attractive structural tonnages. On bars, producers have been quoting 1.65c. as their official price, in spite of the fact that large and medium-sized lots have only been bringing 1.60c. for several weeks. Consequently, the announcement really amounts to an advance in the going prices on plates and shapes, while on bars it merely gives formal recognition to a figure which has represented the real market for some time. It also again brings plates, shapes and bars to the same price level following intermittent attempts in the last year and a half to maintain a higher level on bars. The real importance of the announcement, however, arises from the fact that this is the first constructive step taken by a leading producer to stabilize prices on the heavy hot-rolled products in nearly two years.

From a tonnage standpoint, November business is holding up to October levels, and the prospective placing of car building steel and structural ma-

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
No. 2 fdy., Philadelphia.....	\$18.76	\$18.76	\$18.76	\$21.26
No. 2, Valley furnace.....	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'tl.....	15.19	15.19	15.19	17.69
No. 2, Birmingham.....	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*.....	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa.....	17.75	17.75	17.75	19.75
Basic, Valley furnace.....	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh..	19.26	19.26	19.76	20.76
Malleable, Chicago*.....	17.50	17.50	17.50	20.00
Malleable, Valley.....	17.50	17.50	18.00	19.00
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace....	94.00	94.00	94.00	105.00

Rails, Billets, Etc., Per Gross Ton:	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh..	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh.....	31.00	31.00	31.00	35.00
Slabs, Pittsburgh.....	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh...	36.00	36.00	36.00	40.00
Wire rods, Pittsburgh.....	36.00	36.00	36.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb...	1.60	1.60	1.60	1.85

Finished Steel,	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.60	1.60	1.60	1.90
Bars, Chicago.....	1.70	1.70	1.70	2.00
Bars, Cleveland.....	1.65	1.65	1.65	1.90
Bars, New York.....	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh.....	1.60	1.60	1.60	1.90
Tank plates, Chicago.....	1.70	1.70	1.70	2.00
Tank plates, New York.....	1.88	1.88	1.88	2.17½
Structural shapes, Pittsburgh..	1.60	1.60	1.60	1.90
Structural shapes, Chicago...	1.70	1.70	1.70	2.00
Structural shapes, New York...	1.85½	1.85½	1.85½	2.14½
Cold-finished bars, Pittsburgh	2.00	2.00	2.10	2.30
Hot-rolled strips, Pittsburgh..	1.60	1.60	1.60	1.90
Cold-rolled strips, Pittsburgh	2.35	2.35	2.35	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel,	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh...	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago	2.45	2.45	2.55	2.85
dist. mill.....	2.95	2.95	3.00	3.40
Sheets, galv., No. 24, P'gh...	3.10	3.10	3.10	3.60
Sheets, galv., No. 24, Chicago	2.05	2.05	2.05	2.35
dist. mill.....	2.15	2.25	2.25	2.45
Wire nails, Pittsburgh.....	1.95	1.95	2.00	2.40
Wire nails, Chicago dist. mill.	2.00	2.00	2.05	2.45
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.40
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.45
Barbed wire, galv., P'gh.....	2.60	2.60	2.70	3.05
Barbed wire, galv., Chicago	2.75	2.75	2.85	3.10
dist. mill.....	5.00	5.00	5.00	5.35
Tin plate, 100 lb. box, P'gh..				

Old Material, Per Gross Ton:	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Heavy melting steel, P'gh....	\$13.25	\$13.75	\$14.75	\$16.75
Heavy melting steel, Phila...	11.50	11.50	12.50	15.00
Heavy melting steel, Ch'go...	10.00	10.50	11.50	13.25
Carwheels, Chicago.....	12.50	12.50	13.50	14.00
Carwheels, Philadelphia	14.50	15.00	15.00	15.50
No. 1 cast, Pittsburgh.....	12.50	12.75	13.25	15.00
No. 1 cast, Philadelphia.....	12.00	12.00	13.00	16.00
No. 1 cast, Ch'go (net ton)...	9.50	10.00	11.00	13.50
No. 1 RR. wrot., Phila.....	14.00	14.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)...	8.50	9.00	9.25	12.50

Coke, Connellsville,	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Per Net Ton at Oven:				
Furnace coke, prompt.....	\$2.50	\$2.60	\$2.60	\$2.65
Foundry coke, prompt.....	3.50	3.50	3.50	3.75

Metals,	Nov. 11, 1930	Nov. 3, 1930	Oct. 14, 1930	Nov. 12, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	9.62½	9.62½	10.12½	18.12½
Electrolytic copper, refinery..	9.25	9.25	9.75	17.75
Tin (Straits), New York.....	25.12½	25.75	24.62½	39.37½
Zinc, East St. Louis.....	4.37½	4.25	4.00	6.25
Zinc, New York.....	4.72½	4.60	4.35	6.60
Lead, St. Louis.....	4.95	4.95	4.95	6.10
Lead, New York.....	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y....	7.10	7.12½	7.25	8.62½

material for public works promises to increase mill backlogs before the end of the month. The Virginia Bridge & Iron Co. has been awarded 6500 tons of plates and shapes for 600 coal cars for the Virginian Railway. The Baltimore & Ohio has not yet placed the steel for the 1000 gondola cars which will be built in its own shops, and material is still pending on the 1500 cars which the Pennsylvania will construct. Better plate tonnages are also promised by improved inquiry for barges, and 10 barges and a wharf boat in Middle West will take 1250 tons of steel. More barges are in prospect, but formal inquiry is lacking, and some of this buying may be put off until early next year. No large structural projects are reported placed this week, and new inquiry has been somewhat lighter. Activity in reinforcing bars is also falling off seasonally, but shipments will continue on old projects for some time to come. Bar mills are running at about 40 per cent of capacity, while plate and shape units average 65 to 70 per cent.

Rails and Track Accessories

The improvement in specifications for track accessories, which was noted at the month-end, has now generally subsided. Current business is very

light and little new inquiry is before the trade. Rail inquiry by the larger roads is also yet to come out, but considerable activity is expected in the market before the end of the month.

Tubular Goods

Pipe production in the Pittsburgh district has now declined to levels which are commensurate with current demand, and may be expected to show little adjustment during the remainder of the year except occasionally when line pipe orders now on schedule are completed. Seamless units have dropped to less than 50 per cent of capacity, and little new tonnage is coming out that might bring improvement. Lapweld and butt-weld mills are engaged at about 35 per cent, and the last two months have brought little increase in the demand for standard pipe, which was expected to improve seasonably.

Wire Products

November business is falling under October with most companies, particularly on merchant wire products. Unsettled prices are partly responsible for this stagnation, but jobbers' stocks are ample and few of them are willing to make future commitments. Manufacturers' wire is very dull, and re-

duced activity in the automobile industry is affecting shipments materially. The nail price is still quoted at \$1.95 a keg, Pittsburgh, but the market lacks stability, as some makers are quoting this figure to carload buyers. Under these circumstances, the larger jobbers expect further concessions, and are naturally able to get them if there is any business to be placed. Manufacturers' wire is unchanged at 2.30c., Pittsburgh, with the usual concessions to preferential customers.

Cold-Finished Steel Bars

With little change in the character of specifications, local makers of cold-finished bars are maintaining an operating rate of about 30 per cent of capacity, and new buying is infrequent. Shipments to the automobile industry have not increased, and the specifications of agricultural implement makers are still light. While the official price is unchanged at 2.10c., Pittsburgh, spot buyers are occasionally able to develop a 2c. quotation, which has been in evidence in a limited way for several weeks.

Tin Plate

Consumers are still slow in contracting for the future, but this lack

THE IRON AGE COMPOSITE PRICES

Finished Steel		Pig Iron	Steel Scrap
Nov. 11, 1930	2.135c. a Lb.	\$16.29 a Gross Ton	\$11.58 a Gross Ton
One week ago	2.135c.	16.29	11.92
One month ago	2.135c.	16.29	12.92
One year ago	2.362c.	18.38	15.00
Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.		Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	
HIGH		HIGH	
1930.....	2.362c., Jan. 7	\$18.21, Jan. 7	\$15.00, Feb. 18
1929.....	2.412c., April 2	18.71, May 14	17.58, Jan. 29
1928.....	2.391c., Dec. 11	18.59, Nov. 27	16.50, Dec. 31
1927.....	2.453c., Jan. 4	19.71, Jan. 4	15.25, Jan. 11
1926.....	2.453c., Jan. 5	21.54, Jan. 5	17.25, Jan. 5
1925.....	2.560c., Jan. 6	22.50, Jan. 13	20.83, Jan. 13
LOW		LOW	
1930.....	2.135c., Oct. 14	\$16.29, Oct. 14	\$11.58, Nov. 11
1929.....	2.362c., Oct. 29	18.21, Dec. 17	14.08, Dec. 3
1928.....	2.314c., Jan. 3	17.04, July 24	13.08, July 2
1927.....	2.293c., Oct. 25	17.54, Nov. 1	13.08, Nov. 22
1926.....	2.403c., May 18	19.46, July 13	14.00, June 1
1925.....	2.396c., Aug. 18	18.96, July 7	15.08, May 5

of interest is attributed to the general dullness of business rather than to any particular factors in the tin plate industry. Can makers have ample stocks which they will liquidate before the end of the year, and other companies are in no hurry to make commitments. Tin mill operations in the Pittsburgh district are averaging about 45 per cent of capacity, some of the smaller independent companies running at a lower rate.

Sheets

Declining specifications this month have resulted in further curtailment in sheet mill operations, and even the larger companies are not running at as high as 45 per cent of capacity. Smaller mills are being operated at interrupted schedules, and some of them are not getting sufficient tonnage to justify a full week's operation in a month's time. In most cases mill crews are being kept intact by schedules of one and two days per week, but plant economies are impossible under such arrangements, and the low schedule of prices would hardly permit profits at full operations. The principal sheet consuming industries are apathetic, but forward interest is evidenced in a few lines. Makers of electric refrigerators are beginning to formulate their requirements for production early in the new year and have brought out scattered inquiry. Farm implement manufacturers also seem to be closer to their usual buying movement. Makers of steel office furniture have maintained production fairly well, but radio manufacturers have now practically completed their buying, and demand for electrical sheets is also falling off.

Strip Steel

The strip business this month is not holding up to October levels, as the first week of November was very discouraging both from the standpoint of specifications and new business. Operations have reacted quickly to this decrease, and production has dropped to less than 40 per cent in nearly all mills. In some cases cold-rolling units are not averaging more than 25 per cent. Prices on hot-rolled strip are subject to shading in some territories, but are holding in the Pittsburgh district at 1.60c. and 1.70c., Pittsburgh. Cold-rolled material is unchanged at 2.35c., Pittsburgh or Cleveland.

Coke

Foundry coke is reported to be moving in slightly heavier tonnages this month than last, but this tendency may be only temporary. Prices are weak on the lower grades, but the premium grades are holding at \$4.85, ovens. Furnace coke is very dull and prices have grown softer. While most sellers continue to quote \$2.60, Connellsville, nearly all of them are willing to take business at \$2.50, and the market is quoted at that range.

Old Material

Scrap prices are still tending downward, as mill buying is lacking and dealers seem willing to reduce their offering prices wherever there is any hope for an order. No. 1 heavy melting steel is nominally quotable this week at \$13 to \$13.50, a decline of 50c. a ton from the previous quotation, and distress material is reported to have been offered to one mill in the district at less than \$13. The steel in a recent railroad list is said to have brought only \$13.25, but will

go to a dealer's yard at a freight rate which brings the delivered price to about \$14 a ton. With no steel offered in the Pennsylvania list, railroad offerings have been smaller than usual this month, and good scrap is not plentiful. On the other hand, the prevalence of distress material gives the market a weaker tone than is really justified.

Hydraulic compressed sheets have declined with steel and are quoted this week at \$12.75 to \$13.25. This also represents a decline of 50c. a ton from last week's level, as the range of \$13.75 to \$14.25 carried last week was 50c. higher than the quotation intended. Machine shop turnings are very weak and are reported to have been sold at as low as \$6 a ton. With only one market offered at this time, the price is depressed more than usual. Specialties are also weaker, and the low phosphorus grades are available at lower figures. On nearly all grades dealers are able to pick up occasional lots at prices well below the general market, and yard accumulations are growing. Thus far steel companies are apparently not interested in investment buying, but the placing of substantial orders would stabilize the price very quickly.

Warehouse Prices, f.o.b. Pittsburgh

*Base per Lb.

Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes ..	2.75c.
Reinforcing steel bars	2.75c.
Cold finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.15c. to 3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.75c. to 3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates	2.75c.
Blue annealed sheets (No. 13)	2.65c.
Galv. corrug. sheets (No. 28), per square	4.25c.
Spikes, large	2.65c.
Small	3.05c. to 4.50c.
Boat	3.15c.
Track bolts, all sizes, per 100 count, 60 and 10 per cent off list ..	
Machine bolts, 100 count, 60 and 10 per cent off list ..	
Carriage bolts, 100 count, 60 and 10 per cent off list ..	
Nuts, all styles, 100 count, 60 and 10 per cent off list ..	
Large rivets, base per 100 lb. ..	\$3.30
Wire, black, soft ann'l'd, base per 100 lb.	\$2.40 to 2.50
Wire, galv. soft, base per 100 lb.	2.85 to 2.95
Common wire nails, per keg ..	2.25
Cement coated nails, per keg ..	2.45

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:

No. 1 heavy melting steel ..	\$13.00 to \$13.50
No. 2 heavy melting steel ..	10.50 to 11.00
Scrap rails	12.75 to 13.25
Compressed sheet steel	12.75 to 13.25
Bundled sheets, sides and ends	
Cast iron car wheels	10.50 to 11.00
Sheet bar crops, ordinary ..	13.50 to 14.00
Heavy breakable cast	9.00 to 9.50
No. 2 railroad wrought	13.00 to 13.50
Hvy. steel axle turnings ..	11.00 to 11.50
Machine shop turnings	6.00 to 6.50

Acid Open-Hearth Grades:

Railr. knuckles and couplers ..	15.50 to 16.00
Railr. coil and leaf springs ..	15.50 to 16.00
Roller steel wheels	15.50 to 16.00
Low phos. billet and bloom ends	
Low phos. mill plates	17.00 to 17.50
Low phos. light grades	15.00 to 15.50
Low phos. sheet bar crops ..	15.00 to 15.50
Heavy steel axle turnings ..	16.00 to 16.50
Machine shop turnings	11.00 to 11.50

Electric Furnace Grades:

Low phos. punchings	15.00 to 15.50
Heavy steel axle turnings	11.00 to 11.50

Blast Furnace Grades:

Short shoveling steel turnings ..	8.00 to 8.50
Short mixed borings and turnings ..	8.00 to 8.50
Cast iron borings	8.00 to 8.50

Rolling Mill Grades:

Steel car axles	18.00 to 18.50
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Cupola Grades:

No. 1 cast	12.00 to 13.00
Rails 3 ft. and under	14.00 to 14.50

CHICAGO

Despite Further Drop in Ingot Output Market Tone Is Improving

CHICAGO, Nov. 11.—Changes in the Western iron and steel market are coming slowly, but in most cases their net effect has been to lend weight to the improving side of the market. The fact that mill operations have receded another five points to 45 per cent of ingot capacity is not particularly disturbing for the reason that it indicates a move to gage production by consumption, thereby avoiding accumulations which would have to be absorbed at a later date. Railroad car inquiries, now calling for 2300 cars, are distinctly encouraging, as are other market factors which pertain to prices and the general use of steel.

Quotations on plates, shapes and bars at 1.70c. a lb., Chicago, are on a firmer footing than at any time since prices receded to this level.

Structural inquiries and awards in Western territory are showing improvement, and fabricators of medium and small size are increasing shop schedules.

Railroads, after dragging bottom for several months in the matter of heavy repairs, are again employing men, and needs for steel are already being felt on mill order books.

Agricultural implement manufacturers are slow to respond to their earlier plans to start winter manufacturing schedules this month. Foreign orders now being filled are supporting output at a moderate rate and new inquiries of like kind are in the offing. Demand for farm machinery in the Southwest appears to be more active as indicated this week by a shipment of 50 machines from a nearby plant to Texas.

Viewing the market as a whole, sales in the week were larger than for any like period since last April, there being included as is usual at this time of year a fair portion of rails.

Plates

The local plate market looks very much as it did a week ago except that railroad equipment orders in sight are more promising. The situation as to line pipe releases has not cleared and there is no indication now as to when mills will again benefit by pipe manufacture on a large scale. On the car side of the market there is roughly 35,000 tons of steel business in sight, and the thought is rather commonly expressed here that additional inquiries are in the making. The Santa Fe has made formal inquiry for 1500 freight cars and some special equipment and the Chicago & Illinois Midland is in the market for 400 gondolas and 400 hopper cars. It appears that the Santa Fe did not ask for prices on

Ingot output declines five points to an average of 45 per cent of capacity.

* * *

Factors making for some betterment are in the making, notably in railroad buying and construction work.

* * *

Sales in the week were larger than in any like period since April.

* * *

Price situation is more stable, particularly on bars, shapes and plates.

* * *

Scrap market still an exceedingly weak point, with further declines in major items.

all the cars which it had expected to buy, there being about 500 additional cars on which it may take prices on at a later date.

Additional support is coming to the steel market from railroad shops, some of which have been idle for several months. As a general rule, Western railroads are slowly building up shop organizations, and it seems assured that this program is to be carried still further. The steel tank market affords not less than 15,000 tons in active inquiries. There is one lot of 8000 tons for tanks to be erected at oil pumping plants, and the Phillips Petroleum Co. will make use of 3000 tons in Oklahoma and other producing centers.

The price situation is little changed. Occasional concessions of \$1 a ton are noted, but 1.70c. a lb., Chicago, is the ruling quotation.

Pig Iron

The second week in November is marked by continuation of consumer interest in making commitments for the first quarter of next year. In fact, sales, which remain in fair volume, are for the most part for delivery after the new year begins. If shipments can be taken as a gage of the melt, there is reason to believe that the use of pig iron in this territory is varying little from week to week. Malleable foundries still remain quiet, with promise of better operations if railroad equipment buying expands. Gray iron melters find business spotty, with gains at one point offset by losses at others.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	\$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil	17.50
High phosphorus.....	17.50

Lake Super. charcoal, sil 1.50	27.04
S'th'n No. 2 fdy.....	17.51
Low phos., sil. 1 to 2 cop-per free	\$28.50 to 29.20
Silvery, sil. 8 per cent....	26.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Structural Material

Fresh awards in the immediate vicinity of Chicago total about 2500 tons, but new inquiries for attractive tonnages are scarce. In the West, particularly on the Pacific Coast, there is an attractive list of pending projects, and both Oklahoma City and Omaha show progress in the advancement of new undertakings. Outstanding among awards in Chicago was 1000 tons for a theater, while at Oklahoma City an inquiry for a bank building calls for 3900 tons. Formal awards have been made on the first section of the Randolph Street viaduct. Although the tonnage placed to date is not impressive, it is only indicative of orders that are to follow for completion of the driveway and a station development for the Illinois Central. Property owners along the line of the subway have been given the plans for study and their early approval seems assured. The 35,000 tons of steel now indicated as being needed for this project may not be so very far from the order books of steel mills.

Small orders for fabricated steel are gradually mounting both in numbers and in aggregate tonnage, this situation being reflected in order mails received during the past two weeks. Prices for structural shapes are in general at 1.70c. a lb. The 1.75c. price has practically disappeared.

Bars

Demand for mild steel bars, after dragging throughout the summer and early fall months, again seems on its way to take its normal position in the market relative to other heavy rolled products. Both sales and specifications this week show moderate gains, and inquiries indicate that this tendency will continue in the near future. The change from week to week is small, but nevertheless important in that it is reflecting greater breadth of use.

Resumption of shop operations by a number of Western railroads is creating demand for iron bars, which have been in little use during the summer and early fall. Current orders are light and for immediate shipment. Although not directly shown by specifications for alloy steel

bars, there is rather a general feeling here that sentiment is better at several automobile producing centers. Mention is made of increased schedules by Buick, Hudson, Studebaker and Chevrolet, with Nash operating at a satisfactory schedule considering the business situation as a whole. The prospect of the farm implement manufacturers taking more alloy steel bars is brightened by inquiries for farm machinery for export.

Users of rail steel bars are beginning to look to requirements after the first of the year and some tonnage has been booked for shipment in the early part of 1931. Output at local mills averages 60 per cent of capacity. Prices are steady at 1.65c. a lb., local mill.

Wire Products

Demand from dealers is gradually shrinking, but as this takes place they are asking jobbers for faster and more frequent deliveries, with the result that jobbers are giving closer attention to size and completeness of stocks. This situation is reflected at wire mills and is having the effect of retarding the seasonal slump in demand that is usually experienced at this time of year. Another factor which is tending to hold up the curve of shipments is a very moderate but steady growth in the use of wire by the manufacturing trade.

Prices for manufacturers' wire lack strength at 2.35c. a lb., Chicago.

Cold-Rolled Strips

Output of this commodity remains steady after having dropped several points a week ago to 35 per cent of capacity.

Rails and Track Supplies

Local producers estimate that about one-fourth of the next year's rails are now on order books. Sales in the week were of little moment, but it is rather generally believed that sizable inquiries are developing. Among these will be tonnages from the New York Central, Pennsylvania, Illinois Central, Milwaukee and Rock Island. The Grand Trunk is said to be studying needs for its Canadian and United States lines. Several scattered lots of track supplies have added 4000 tons to local producers' books.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bessemer rails, \$43; light rails, rolled from billets, \$36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

Cast Iron Pipe

Of special interest to cast iron pipe producers is the ease with which bond issues carried at the recent elections. There is much promise in the way of tonnage in Iowa, Illinois and Michigan. It is reported that Detroit has placed 3500 tons of 24 and 36-in. pipe and Milwaukee and Kenosha, Wis., are in the market for small tonnages. Private buying, though still spotty and scattered, has been more active in the last week or

10 days. Most of these purchases are for prompt delivery. A project reported from St. Louis County, Mo., calls for an expenditure of \$1,500,000 in 1931.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$44 to \$45; 4-in., \$47 to \$48; Class A and gas pipe, \$3 extra.

Reinforcing Bars

Encouragement given dealers a week ago by local architects appears to have been well founded, as fully 2000 tons of new work is now being estimated. In a market of this kind, however, there is always uncertainty as to financial backing for a project. There is also the seasonal factor, which at this time of year usually forecasts spring rather than winter construction. A fair sprinkling of small orders is reaching shops and operations remain at last week's level, but conditions in general point to lower output by the middle of the month. Competition remains keen, and prices lack strength.

Sheets

Both new buying and specifications are lighter than a week ago and, as a consequence, output is off several points to a range of 45 to 50 per cent of capacity. The hot mills at Milwaukee resumed operations on Nov. 10.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.15c.; No. 10 blue ann'l'd, 2.05c. to 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Bolts, Nuts and Rivets

Although the farm implement manufacturers have specified a trifle more liberally, the bolt and nut business from this point of view is far below expectations.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes.....	3.00c.
Soft steel bars.....	2.90c.
Reinforcing bars, billet steel—	
Less than 5 tons.....	2.85c.
5 tons to 30 tons.....	2.45c.
30 tons to 200 tons.....	2.00c.
200 tons and over.....	1.75c.
Rail steel reinforcement—	
Less than 5 tons.....	2.50c.
5 tons to 30 tons.....	2.10c.
30 tons and over.....	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.35c.
Flats and squares.....	3.85c.
Bands $\frac{3}{8}$ in. (in Nos. 10 and 12 gages).....	3.10c.
Hoops (No. 14 gage and lighter).....	3.65c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.35c.
Blue ann'l'd sheets (No. 10).....	3.35c.
Spikes ($\frac{3}{8}$ in. and larger).....	3.55c.
Track bolts.....	4.55c.
Rivets, structural.....	4.00c.
Rivets, boiler.....	4.00c.
	Per Cent Off List
Machine bolts.....	60 and 10
Carriage bolts.....	60 and 10
Coach or lag screws.....	60 and 10
Hot-pressed nuts, sq., tap. or blank,.....	60 and 10
Hot-pressed nuts, hex., tap. or blank,.....	60 and 10
No. 8 black ann'l'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg.....	\$2.30 to 2.55
Cement c'd nails, base per keg.....	2.30 to 2.55

Coke

Contracts for the first half and in many cases for the new year are well covered at \$8 a ton, local ovens. Spot buying is of little moment. Shipments thus far in November are a little heavier than in the preceding month, the difference quite evidently being due to foundry heating requirements.

Old Material

Prices continue to drift downward, following the lead of the heavy tonnage grades. Steel mill users of heavy melting steel have this week refused offers at \$10.50 a gross ton, delivered, the reason being that storage spaces are filled and that new purchases must be in line with consumption, which is gaged by ingot output at 45 per cent of capacity. Cast iron borings have been sold for delivery out of Chicago at a price which figures to \$4.50 a ton, delivered to local consumers. A new factor contributing to distress of the local market is the fact that dealers' orders are fast being filled and it is becoming increasingly difficult to place incoming shipments.

Prices deliv'd Chicago district consumers:

Per Gross Ton	
Basic Open-Hearth Grades:	
Heavy melting steel.....	\$10.00 to \$10.50
Shoveling steel.....	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings.....	7.75 to 8.25
No. 1 busheling.....	8.00 to 8.50
Forg'd cast and r'l'd steel carwheels.....	13.75 to 14.25
Railroad tires, charg. box size.....	13.50 to 14.00
Railroad leaf springs cut apart.....	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coil springs.....	13.25 to 13.75
Electric Furnace Grades:	
Axle turnings.....	9.25 to 9.75
Low phos. punchings....	12.00 to 12.50
Low phos. plates, 12 in. and under.....	12.00 to 12.50
Blast Furnace Grades:	
Axle turnings.....	5.75 to 6.25
Cast iron borings.....	4.00 to 4.50
Short shoveling turnings..	4.75 to 5.25
Machine shop turnings....	4.75 to 5.25
Rolling Mill Grades:	
Iron rails.....	11.50 to 12.00
Rerolling rails.....	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft.	12.50 to 13.00
Steel rails, less than 2 ft.	13.00 to 13.50
Angle bars, steel.....	12.00 to 12.50
Cast iron carwheels.....	12.50 to 13.00
Malleable Grades:	
Railroad.....	13.00 to 13.50
Agricultural.....	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier.....	26.00 to 31.00
Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars.	10.50 to 11.00
Iron arch bars, and transoms.....	11.00 to 11.50
Iron car axles.....	20.50 to 21.50
Steel car axles.....	13.50 to 14.00
No. 1 railroad wrought....	8.50 to 9.00
No. 2 railroad wrought....	9.25 to 9.75
No. 1 busheling.....	6.50 to 7.00
No. 2 busheling.....	4.50 to 5.00
Locomotive tires, smooth..	12.50 to 13.00
Pipes and flues.....	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast.....	9.50 to 10.00
No. 1 railroad cast.....	9.00 to 9.50
No. 1 agricultural cast....	8.50 to 9.00
Stove plate.....	7.50 to 8.00
Grate bars.....	7.00 to 7.50
Brake shoes.....	7.25 to 7.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

CLEVELAND

Outlook in Automobile Industry Slightly More Encouraging

CLEVELAND, Nov. 11.—Slightly more encouraging reports are coming from the motor car industry than recently. While the November output of cars will be very low, some of the automobile manufacturers are planning to get under way shortly on new models and, with the Chevrolet company now under production on its new cars, December output is expected to show a moderate gain over that of this month.

The number of steel orders in this territory shows a slight gain, but the size of the orders remains very small. Consumer stocks are being further reduced and are expected to be lower on Jan. 1 than on that date for many years.

No change is reported in operations in metal-working plants. Local stamping plants that cater to the automotive trade are doing very little. The only interest in forward buying is shown by a few of the motor car manufacturers which have placed some orders for car parts for the first quarter or half, apparently at very attractive prices.

Steel plant operations in Cleveland were increased this week with the starting up of four open-hearth furnaces by one producer whose steel plant had been shut down for two weeks. Local mills are now operating at 32 per cent of ingot capacity, a gain of 12 points. Finishing mills are operating intermittently.

A large tonnage of steel in structural material, sheet steel piling and reinforcing bars for municipal work in Cleveland will be required for projects for which bond issues aggregating over \$30,000,000 were approved at the recent election. These include the Main Avenue bridge, Cuyahoga River straightening, hospitals, sanatoriums, a children's detention home and sewage disposal work. However, it will be several months before any of these projects reach the contract stage. A new pipe line project calls for the building of a gas pipe line from Louisiana to Detroit.

Pig Iron

Sales increased slightly the past week. One interest took orders for 10,000 tons, largely for the first quarter. This included two or three good-sized lots. Very little of the business came from the motor car industry. Shipments in some sections show a gain over those of October. However, demand in this territory is very light and some foundries are holding up shipments. Some jobbing foundries in the northern Ohio territory are not operating so well as recently.

Prices are unchanged, except that in Michigan, where \$18 has been the prevailing price for foundry and malleable iron, there is now a spread of

\$17.50 to \$18. Lake furnace prices for shipment to other districts range from \$16 to \$17. The Cleveland price for local delivery is \$17.50, furnace.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25.	\$17.50
S'th'n fdy., sil. 1.75 to 2.25.	\$17.51 to 18.01
Malleable	17.50
Ohio silvery, 8 per cent.	25.00
Stand. low phos., Valley.	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

Iron Ore

Lake Superior ore on Lake Erie docks Nov. 1 amounted to 6,341,608 tons, compared with 6,365,342 tons on the same date a year ago. Receipts at Lake Erie ports during October were 4,011,476 tons and for the season to Nov. 1 were 30,251,436 tons, compared with 42,627,849 tons during the same period last year. Shipments from these docks in November were 2,638,128 tons and for the season to Nov. 1 were 22,044,968 tons, against 30,886,416 tons for the same period last year. Receipts at Detroit, Lake Michigan and Canadian ports in October were 1,675,099 tons and to Nov. 1 they were 13,345,485 tons, against 17,105,832 tons during the same period last year.

Bars, Plates and Shapes

The purpose of the announcement of a minimum price of 1.60c., Pittsburgh, on shapes, plates and bars for current orders evidently is to impress upon the trade that there will be no concession from that price. The Cleveland base on steel bars is unchanged at 1.60c. for outside shipment and 1.65c. for local delivery. However, one outside producer which has been using the Cleveland base in this territory announces that hereafter it will adhere to the Pittsburgh base. Business is limited to scattering small-lot orders. Inquiry for structural steel work is very light, and fresh weakness has brought prices of fabricated material to very low levels.

Wire Products

The market shows little life, although an occasional car-lot order for

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes.....	2.95c.
Soft steel bars.....	2.85c.
Reinforc. steel bars.....	2.25c. to 2.50c.
Cold-fin. rounds and hex.....	3.40c.
Cold-fin. flats and sq.....	3.90c.
Hoops and bands, No. 12 to 4 in., inclusive	3.10c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	5.95c.
Black sheets (No. 24).....	3.60c.
Galvanized sheets (No. 24).....	4.35c.
Blue ann'd sheets (No. 10).....	3.10c.
No. 9 ann'd wire, per 100 lb.....	\$2.50
No. 9 galv. wire, per 100 lb.....	2.95
Com. wire nails, base per keg.....	2.40

*Net base, including boxing and cutting to length.

nails is coming out. Rather sharp concessions are reported on nails carrying large extras. However, the usual price range is \$1.90 to \$2 a keg, Cleveland.

Sheets

There was very little activity the past week either in specifications or new business. The Cleveland plant of the Fisher Body Corp. placed some additional tonnage for Chevrolet bodies, although its releases were not as large as expected. Local stamping plants have little automotive work. There has been some curtailment in schedules by the electric refrigeration industry. With one or two exceptions, business with stove manufacturers is slack and this is being reflected in light demand for enameling sheets. There is virtually no change in the price situation with the exception of concessions to 2.90c. to jobbers on galvanized sheets. Black sheets are holding at 2.35c., Pittsburgh. Light plates are quoted at 1.90c., No. 13 blue annealed at 2.05c., with continuous mills going \$2 to \$4 a ton lower.

Strip Steel

Orders for both hot and cold-rolled strip are still very scarce. There is some small-lot demand from industries outside of the automotive field. Hot-rolled strip is unchanged at 1.60c., Pittsburgh, for wide and 1.70c. for narrow, although there are reports of concessions from these prices. On cold-rolled strip, 2.35c., Cleveland, is being maintained.

Old Material

Local mills are taking no scrap, and shipments by Cleveland dealers to Valley district mills have been held up. With shipments suspended, the market is virtually at a standstill. Prices continue weak and, while they are untested, it is not believed that they will go much lower.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$11.00 to \$11.25
No. 2 heavy melting steel.....	10.50 to 10.75
Compressed sheet steel.....	10.50 to 11.00
Light bundled sheet	
stampings	9.00 to 9.25
Drop forge flashings.....	10.00 to 10.50
Machine shop turnings.....	5.00 to 5.50
Short shoveling turnings.....	7.75 to 8.00
No. 1 railroad wrought.....	13.00 to 13.50
No. 2 railroad wrought.....	14.00 to 14.50
No. 1 busheling.....	11.00 to 11.50
Pipes and flues.....	9.00 to 9.50
Steel axle turnings.....	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops.....	17.50 to 18.00
Blast Furnace Grades:	
Cast iron borings.....	7.50 to 7.75
Mixed borings and short turnings.....	7.50 to 7.75
No. 2 busheling.....	6.75 to 7.00
Cupola Grades:	
No. 1 cast.....	13.00 to 13.50
Railroad grate bars.....	10.00 to 10.50
Stove plate	10.50 to 11.00
Rails under 3 ft.....	16.00 to 16.50
Miscellaneous:	
Rails for rolling.....	16.25 to 16.50
Railroad malleable	15.00 to 15.50

NEW YORK

American Radiator Co. Places Large Pig Iron Tonnage

NEW YORK, Nov. 11.—The American Radiator Co. has bought 50,000 tons of pig iron, placing part of it with an Alabama producer and the remainder with an Eastern furnace. This purchase, together with stocks at the company's plants and at its North Tonawanda, N. Y., furnace, will cover requirements for about six months. It is understood that the Southern iron will be shipped to the company's Birmingham plant and various Western and Northern plants, possibly including the Louisville, Ky., plant of the Standard Sanitary Corp'n. The Buffalo foundries will be served by the North Tonawanda furnace, while Eastern iron will be shipped to the Bayonne, N. J., plant, the operations of which are being increased. The purchase prices have not been made public, but in view of the size of the tonnage involved it is believed that the nominal Birmingham prices of \$14 for local delivery and \$11 for outside shipment were shaded at least \$1 a ton. The action of the radiator company is interpreted as indicating that it believes that prices are scraping bottom. It also, no doubt, was prompted in part by the improved building outlook. Sales last week by local brokers totaled only 4500 tons, compared with 7000 tons in the previous week. However, the radiator company purchase has served to stimulate interest, and one new inquiry resulted in a 1000-ton sale today. The Worthington Pump & Machinery Corp'n. is inquiring for 800 tons for its Buffalo plant. The American Locomotive Co. has placed 350 tons for its Schenectady, N. Y., works. The Foran Foundry & Mfg. Co., Flemington, N. J., has not yet closed on its inquiry for 1500 tons. The National Radiator Corp'n. recently placed 3000 tons of Northern and Southern iron for its Trenton, N. J., plant.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25.....\$20.41 to \$20.91
*Buff. No. 2, del'd east. N. J. 18.78 to 19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25..... 18.39 to 19.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75..... 18.89 to 19.89

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Cast Iron Pipe

Inquiry for pressure pipe is beginning to improve, with certain of the public utility companies showing interest in buying for winter and spring delivery. The Federal Water Service Co., New York, is taking bids on about 300 tons of 20-in. water pipe for Charleston, W. Va., and the Consolidated Gas & Electric Co., Baltimore, is in the market for a small tonnage of gas pipe. Despite lack of business in the past few weeks, prices continue firm at \$36 to \$37 a net ton, f.o.b.

Northern foundry, but concessions to users willing to accept winter delivery are expected.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, \$38.90 to \$39.90; 4-in. and 5-in., \$41.90 to \$42.90; 3-in., \$48.90 to \$49.90. Class A and gas pipe, \$3 extra.

Reinforcing Bars

General contract bids are to be taken Nov. 18 on an extension of the West Street elevated highway, New York, requiring 1000 tons. Otherwise the market is quiet, with awards limited to relatively small tonnages.

For mill shipment, distributors of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at \$4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

Finished Steel

Aside from structural steel work, the local steel market is lacking in important tonnage. The New York Central is inquiring for 15,000 tons of fabricated material for its section of the West Side elevated highway, and two subway sections totaling 14,800 tons are up for bids, but one of these sections, requiring 5100 tons, is being bid on for the second time. For another subway section, 12,500 tons has been awarded.

While there is an expectation in the railroad equipment trade that the railroads will come out for a fair volume of new cars, the inquiries that have thus far appeared are chiefly from the West. The Chicago & Illinois Midland has inquired for 800 cars.

The announcement of the Carnegie Steel Co. of a minimum price of

Warehouse Prices, f.o.b. New York

Base per Lb.
Plates and structural shapes..... 3.10c.
Soft steel bars, small shapes..... 3.10c.
Iron bars 3.24c.
Iron bars, Swed. charcoal... 7.00c. to 7.25c.
Cold-fin. shafting and screw stock—
Rounds and hexagons..... 3.40c.
Flats and squares..... 3.90c.
Cold-roll. strip, soft and quarter hard 4.95c.
Hoops 3.75c.
Bands 3.40c.
Blue ann'd sheets (No. 10)..... 3.25c. to 3.40c.
Black sheets (No. 24*)..... 3.65c. to 3.75c.
Galvanized sheets (No. 24*)..... 4.25c.
Long terme sheets (No. 24)..... 5.80c.
Standard tool steel..... 12.00c.
Wire, black annealed..... 4.50c.
Wire, galv. annealed..... 5.15c.
Tire steel, ½ x ½ in. and larger... 3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger 3.75c.
Open-hearth spring steel, bases, 4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Machine bolts, cut thread: Per Cent Off List
¾ x 6 in. and smaller..... 65
1 x 30 in. and smaller..... 65

Carriage bolts, cut thread:
¾ x 6 in. and smaller..... 65
¾ x 20 in. and smaller..... 65

Boiler Tubes: Per 100 Ft.
Lap welded, 2-in..... \$19.00

Seamless steel, 2-in..... 20.25

Charcoal iron, 2-in..... 26.25

Charcoal iron, 4-in..... 67.00

1.60c., Pittsburgh, on bars, shapes and plates is in line with efforts that have been made lately to stabilize the market at this level. Eastern mills have been holding fairly well to 1.70c., Bethlehem, for shapes, and 1.70c., Coatesville, for plates. On most of the other steel products there is no real test of prices because orders are for such small lots. The 3c. quotation on galvanized sheets has virtually disappeared even as an asking price, and the usual quotation is 2.95c., with jobbers being able to buy at 2.90c.

Warehouse Business

Buying from stock continues to be limited to small orders. Prices on some products are subject to occasional concessions.

Coke

The best that can be said of foundry coke specifications is that they are holding their own. Furnace coke demand has not yet responded to the colder weather. Foundries are no longer important buyers of furnace coke, now using broken foundry coke for heating purposes. Furnace coke prices range from \$2.50 to \$2.60 a net ton, Connellsville, and foundry coke quotations follow:

Special brands of beehive foundry coke, \$4.70 to \$4.85 a net ton, ovens, or \$8.41 to \$8.56 delivered to northern New Jersey, Jersey City and Newark, and \$9.29 to \$9.44 to New York and Brooklyn; by-product foundry coke, \$9 to \$9.40, Newark or Jersey City; \$10.06, New York or Brooklyn.

Old Material

A small tonnage of No. 1 heavy melting steel has been bought by an eastern Pennsylvania consumer at \$12 a ton, delivered, and brokers filling contracts have reduced their buying prices for this grade to \$11.50 a ton, delivered, or about \$8, New York. With barge shipments to a Bridgeport, Conn., consumer of No. 1 steel completed, eastern Pennsylvania is the only district to which material may be shipped at present.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel... \$8.00
Heavy melting steel (yard) 5.50 to 5.75
No. 1 hvy. breakable cast... 6.75 to 7.50
Stove plate (steel works)... 5.00
Locomotive grate bars.... 5.00
Machine shop turnings.... 4.00
Short shoveling turnings... 4.00
Cast borings (blast fur. or steel works) 4.00
Mixed borings and turnings 3.75
Steel car axles..... 16.00
Iron car axles 19.00
Iron and steel pipe (1 in. dia., not under 2 ft. long) 7.25
Forge fire 7.00
No. 1 railroad wrought... 8.75
No. 1 yard wrought... 7.75
Rails for rolling..... 9.25 to 9.75
Stove plate (foundry)..... 5.50
Malleable cast (railroad)... 9.50 to 10.00
Cast borings (chemical)... 8.50 to 9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast..... \$13.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size..... 11.00
No. 2 cast (radiators, cast boilers, etc.) 10.50

PHILADELPHIA

Mill Operations Off— Black Sheet Extras Reduced

PHILADELPHIA, Nov. 11.—New steel business has declined in the past week, and mill operations have generally receded to about 45 per cent of capacity, except for the leading independent interest, which is at a slightly higher rate. Prices, however, are fairly well maintained, except for occasional concessions of \$1 to \$2 a ton on shapes. Sheet quotations show no further change in the base price, but effective Nov. 10, one maker has announced new width and length extras on black, hot-rolled pickled and picked cold-rolled sheets. Other mills expect to follow in adopting the new extras, which are in most cases about half the former charges.

Some substantial steel tonnages are in the market, including miscellaneous requirements of the Pennsylvania Railroad, bids on which will be opened Nov. 17, and which are in addition to about 24,000 tons of material for building 1500 gondola cars in the railroad's own shops. Orders for the car steel were distributed to mills in Pittsburgh and eastern Pennsylvania. Bids on the plates, shapes and bars in this tonnage were 1.60c. a lb., f.o.b. mill. The United States Army will inquire in about two weeks for aircraft hangars at various fields, requiring about 10,000 tons of structural steel. Award of the contract for a large gas holder for the Philadelphia Electric Co., requiring 2400 tons of plates and 800 tons of shapes, is expected next week.

Steel Bars

A steady volume of small orders continues, and the price is unchanged at 1.60c., Pittsburgh, or 1.89c., delivered Philadelphia. New projects requiring reinforcing bars are small, but some substantial business is pending award. About 800 tons of reinforcing steel in a factory for the Campbell Soup Co. at Camden, N. J., has been awarded to the Kalman Steel Co. Billet steel reinforcing bars are quoted at 1.70c. to 1.75c. a lb., Pittsburgh, or 1.99c. to 2.04c., Philadelphia. Rail steel reinforcing bars are quoted at 1.55c., Franklin, Pa., or 1.84c., Philadelphia.

Pig Iron

Consumers are pressing for prompt delivery of carload lots of foundry iron, having almost no reserve stocks on which to draw for current requirements. Future buying, however, is still limited to small lots, with the exception of an occasional purchase by a large consumer such as the American Radiator Co., which has closed on upward of 50,000 tons of foundry iron with Southern producers. The York Ice Machinery Co., York, Pa., has closed on about 200 tons of foundry grade and the S.

Morgan Smith Co., also of York, has bought 500 tons for delivery in the first quarter. Demand for low phosphorus pig iron is still small, but about 2000 tons of British iron has been sold in small lots to eastern Pennsylvania consumers at prices reported to be about \$1 a ton less than the delivered prices recently quoted by British sellers. On foundry iron, eastern Pennsylvania furnaces continue to quote \$18 to \$18.50 a ton in the immediate district.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	\$18.76 to \$19.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	19.26 to 19.76
East. Pa. No. 1X, 1.75 to 2.25 sil.	19.76 to 20.26
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	21.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'rg low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Shapes

Quotations range from 1.65c. to 1.70c. a lb., f.o.b. nearest mill to consumer, or 1.71c. to 1.76c., delivered Philadelphia. On desirable tonnages, concessions of \$1 a ton to 1.60c. f.o.b. mill, or 1.66c., Philadelphia, are not uncommon.

Plates

Most of the present plate business is being placed at 1.70c. a lb., Coatesville, Pa., or 1.80½c., Philadelphia, only the larger and more desirable orders bringing concessions to 1.65c., Coatesville, or 1.75½c., Philadelphia. A small part of the 24,000 tons of steel awarded by the Pennsylvania Railroad for 1500 gondola cars was placed with eastern Pennsylvania mills.

Sheets

No reduction in operating rates of sheet consumers in this district is ap-

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ¼-in. inclu.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
†Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'l'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

parent, but immediate requirements have been satisfied, so that current buying of sheets is small. Output of two of the leading radio manufacturers in this district continues at a fairly high level in two plants, but the third is still operating at only a small percentage of capacity. Black sheets are quoted at 2.35c. a lb., Pittsburgh, or 2.64c., Philadelphia, and galvanized sheets range from 2.90c. to 3c., Pittsburgh, or 3.19c. to 3.29c., Philadelphia. Blue annealed sheets, No. 13 gage, are 2.05c. to 2.15c., Pittsburgh, or 2.34c. to 2.44c., Philadelphia, and blue annealed plates, No. 10 gage, are 1.90c. to 2c., Pittsburgh, or 2.19c. to 2.29c., delivered Philadelphia.

Imports

In the week ended Nov. 8 arrivals at this port from abroad consisted of 2882 tons of pig iron from British India.

Old Material

The trend of prices on all grades of iron and steel scrap is still downward. A Phoenixville, Pa., consumer of machine shop turnings has bought at \$7 a ton, delivered, from local supplies, and at \$8 a ton for delivery from New England. A Harrisburg, Pa., mill has bought heavy breakable cast at \$11 a ton, delivered, 50c. lower than on previous purchases. Stove plate and locomotive grate bars are quotable at \$9 a ton, delivered, based on the latest contracts for these grades. No. 1 heavy melting steel, however, is unchanged, and brokers are still paying \$12 a ton for material to complete current contracts.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	\$11.50 to \$12.50
No. 2 heavy melting steel	10.00
Heavy melting steel (yard)	9.50
No. 1 railroad wrought	14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 11.00
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	7.00 to 8.00
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)	8.50
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars	9.00 to 9.50
Stove plate (for steel works)	9.00 to 9.50
No. 1 low phos., hvy., 0.04% and under	19.00 to 20.00
Couplers and knuckles	16.50 to 17.50
Rolled steel wheels	15.50 to 16.00
No. 1 blast f'nace scrap	7.50
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire	11.00
Cast iron carwheels	14.50 to 15.00
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	13.50 to 14.00

BOSTON

Pig Iron Market a Little Firmer—Scrap Is Weaker

BOSTON, Nov. 11.—Pig iron prices appear a little firmer owing to the withdrawal of a Buffalo district furnace from this market, this action being based on the contemplated blowing out of a furnace. Its price on No. 2 plain, No. 2X and No. 1X iron was \$15.50 a ton, furnace, and the withdrawal leaves the market for No. 2X at \$16 and at \$16.50 for No. 1X. Furnaces east of Buffalo have not had to go below the delivered equivalent of \$16 a ton, Buffalo furnace, to secure business. Business is quiet, however, sales the past week falling short of 3000 tons, and there is no telling what might happen if a large tonnage came into the market. The only sizable inquiry is for 500 tons for March delivery. Indian No. 2X iron is selling at \$20.50 a ton, on dock here, duty paid, and some sales of No. 1X were made the past week at \$21.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25...	\$19.78 to \$20.28
†Buffalo, sil. 2.25 to 2.75...	19.78 to 20.28
*Buffalo, sil. 1.75 to 2.25...	20.41 to 20.91
*Buffalo, sil. 2.25 to 2.75...	20.91 to 21.41
Va., sil. 1.75 to 2.75...	25.21
Va., sil. 2.25 to 2.75...	25.71
*Ala., sil. 1.75 to 2.25...	21.11
*Ala., sil. 2.25 to 2.75...	21.61
†Ala., sil. 1.75 to 2.25...	17.25
†Ala., sil. 2.25 to 2.75...	17.75

Freight rates: \$4.91 all rail and \$4.28 rail and water from Buffalo; \$5.21 all rail from Virginia; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Cast Iron Pipe

Attleboro, Mass., has awarded 100 tons of 8-in. pipe to the United States Pipe & Foundry Co., and Beverly, Mass., a like amount of 6-in. stock to Warren Foundry & Pipe Co. Otherwise, business is in car lots. Norfolk, Mass., is reported to be in the market for 246 tons of 12-in. pipe.

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams.....	3.365c.
Tees	3.365c.
Zees	3.365c.
Soft steel bars, small shapes.....	3.265c.
Flats, hot-rolled.....	4.15c.
Reinforcing bars.....	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds.....	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	3.50c. to 5.55c.
Squares and flats.....	4.00c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler.....	4.50c.
	Per Cent Off List
Machine bolts .....	.60 and 5
Carriage bolts .....	.60 and 5
Lag screws .....	.60 and 5
Hot-pressed nuts .....	.60 and 5
Cold-punched nuts .....	.60 and 5
Stove bolts .....	.70 and 10

Two Massachusetts municipalities are sounding out the market for large tonnages, but details are withheld. The current price for small lots of pipe is \$36 a ton, f.o.b. foundry, for 6-in. and larger dimensions, but large tonnages can be purchased at less. A \$3 differential is asked on Class A and gas pipe. The Warren Foundry & Pipe Co. has started operations at its new Everett, Mass., plant.

Fabricated Steel

No individual letting the past week exceeded 360 tons, and no new important tonnages developed. The market is less active than at any time during the past year. Quite a number of bridge jobs are developing in Massachusetts and Maine, which may serve to pull the market out of the doldrums next month.

Reinforcing Steel

Current business is confined to small tonnages. Billet steel bars in 100-ton lots and larger can be had at 2.20c. a lb., base, as against 2.25c. heretofore, and one concern has made offers at 2.15c. Several hundred tons are overhanging the market, but buyers apparently are in no hurry to cover. The Massachusetts Institute

of Technology has plans for a physics laboratory.

Old Material

The American Steel & Wire Co., Worcester, Mass., is buying a little long bundled skeleton; a Portland, Me., rolling mill has taken some axles, and chemical borings are in demand. Otherwise, there is little call for any material. Prices, which are generally lower, are very largely nominal. Mayer Pollock, Pottstown, Pa., has purchased an old power plant from the Boston Consolidated Gas Co., and is dismantling it. About 4000 tons of steel scrap is involved.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel..	\$7.10 to \$7.50
Scrap T rails.....	7.10 to 7.50
Scrap girder rails.....	6.50 to 7.00
No. 1 railroad wrought....	8.00 to 8.50
Machine shop turnings....	2.75 to 3.25
Cast iron borings (steel works and rolling mill)	3.00 to 3.25
Bundled skeleton, long....	6.00 to 6.50
Forge flashings.....	6.00 to 6.50
Blast furnace borings and turnings	2.50 to 3.00
Forge scrap	5.75 to 6.00
Shafting	13.00 to 14.00
Steel car axles	16.00 to 17.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.50 to 7.00
Rails for rolling.....	10.00 to 10.25
Cast iron borings, chemical	9.00 to 9.50

Prices per gross ton deliv'd consumers' yards:

Textile cast	\$11.00 to \$11.50
No. 1 machinery cast....	11.50 to 12.50
No. 2 machinery cast....	10.00 to 10.50
Stove plate	8.00 to 8.50
Railroad malleable	14.00 to 14.50

BIRMINGHAM

American Radiator Places Large Pig Iron Tonnage

BIRMINGHAM, Nov. 11.—What is said to be one of the largest pig iron orders placed in this district in years was announced last week by the American Radiator & Standard Sanitary Corpn. A. E. Geddes, vice-president and general manager of the American Radiator Co., New York, was in Birmingham last week in connection with the deal and authorized the following statement:

"The American Radiator & Standard Sanitary Corpn. has just placed an order in Birmingham district for one of the largest tonnages of pig iron placed here in years. This tonnage will be distributed to the corporation's various manufacturing plants throughout the country."

No statement was made as to the tonnage, the price paid, delivery dates, or what producers shared in the order. The tonnage is variously estimated here at from 50,000 tons to 100,000 tons.

Except for this tonnage, buying has been on a spot basis, with small orders predominating. In two instances shipments are reported to be gaining. Some melters with iron under contract have given estimates on shipments to be required during November, but in most cases shipping instructions continue to cover only a few days ahead. Old contracts that were carried over from the third quarter are nearing completion.

Of the 10 blast furnaces that continue active, seven are operated by merchant producers and three by steel mills. Nine furnaces are on foundry iron and one on basic iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.....	\$14.00
No. 1 fdy., 2.25 to 2.75 sil.....	14.50
Basic	14.00

Finished Steel

Sales for the first week of November moved up another notch as compared with the October average, which exceeded that of September. The gradual climb in sales during the past three weeks has been unaided by rail or railroad accessory buying, this being the first time in years that rail backlogs have not begun to assume importance by this date. Sheets, wire products and shapes are sharing in the slowly expanding demand. Operating schedules at the mills are holding their own, the present rate being sufficient to handle current demand. Quotations on bars, plates and shapes last week established another low mark for the year when a reduction of \$1 a ton was made. This brings the quoted prices to 1.75c. to 1.80c. on these products. Galvanized sheets are also off \$1 a ton at 3.10c. to 3.15c. a lb. Other quotations are unchanged.

Very little tonnage has been added to books of structural steel fabricators. Plate and tank fabricators are

taking advantage of a dull market and light operating schedules to get shops in good shape for improved demand when it comes. Tonnage in immediate prospect offers no encouragement. Reinforcing bar makers report growing inquiries from utilities, bridge and highway sources. Active open-hearths total nine out of 23, the same as reported last week.

Cast Iron Pipe

Demand is on about the same level as in the past two weeks, though expected improvement for the near future has become more certain with the voting of several municipal bond issues at the elections on Nov. 4. Some utilities are also getting plans in shape for early work. Pressure pipe makers report that a large utility company, operating plants throughout the country, is inquiring for a considerable tonnage of pipe. Los Angeles is reported among the cities that is planning to buy more pipe soon. The National Cast Iron Pipe Co. is low bidder on about 1000 tons for St. Louis. The project at Marrero, La., requiring 800 to 900 tons, is to be placed by contractor shortly. Inquiries for soil pipe are reported to be improving, Government work and some export tonnage being included. Operations are reported to be at about the same level, though

more pipe is going to stock than in October. Base prices continue at \$37 to \$38, Birmingham.

Coke

The foundry and industrial coke market is still in the sluggish state that has prevailed for the past few months. The movement of foundry coke shows little change from the slow rate of October. There are 912 active by-product coke ovens and 478 idle ovens. The quotation remains at \$5 a net ton, Birmingham.

Old Material

For the first time in weeks, inquiries and potential demand are said to be looking up. A steel company is reported to have placed a fairly large order for heavy melting steel. Dealers' stocks are more than ample for the present light trading.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:	
Heavy melting steel.....	\$10.00 to \$10.75
Scrap steel rails.....	12.50
Short shoveling turnings..	9.25
Cast iron borings.....	9.00
Stove plate.....	9.50
Steel axles.....	20.50 to 21.00
Iron axles.....	21.00
No. 1 railroad wrought...	10.00
Rails for rolling.....	11.50 to 12.00
No. 1 cast.....	11.50
Tramcar wheels.....	11.50
Cast iron borings, chem....	13.50
Cast iron carwheels.....	11.00

PACIFIC COAST

SAN FRANCISCO, Nov. 8.—(By Air Mail.)—Awards of steel products on the Pacific Coast this week totaled about 9000 tons. The largest was a 38 and 54-in. welded steel pipe line for Los Angeles, placed with the Western Pipe & Steel Co., which calls for 1700 tons of plates. While pending business involves a fair tonnage, new inquiries were mostly for unimportant lots. Little change is noted in the price structure.

Bars

Reinforcing bar awards exceeded 1100 tons. The largest tonnage was booked by the Pacific Coast Steel Corp.—325 tons for a building in Berkeley for the University of California. Upward of 300 tons for seven bridges in Oregon was placed with unnamed interests. Included among new inquiries was 150 tons for a theater at Billings, Mont. An award of 350 tons for a garage on Sixth Avenue, Seattle, is expected to be placed next week. The general contract was secured by the J. W.

Warehouse Prices, f.o.b. San Francisco

Base per Lb.	
Plates and struc. shapes.....	3.40c.
Soft steel bars.....	3.40c.
Black sheets (No. 24).....	4.35c.
Blue ann'l'd sheets (No. 10).....	3.80c.
Galv. sheets (No. 24).....	5.00c.
Struc. rivets, ½-in. and larger....	5.00c.
Com. wire nails, base per keg....	\$3.35
Cement c't'd nails, 100 lb. keg....	3.35

Major Steel Awards of Week Call for 9000 Tons

Fig iron prices per gross ton at San Francisco:	
*Utah basic.....	\$22.00 to \$24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00
*Delivered San Francisco.	
**Duty paid, f.o.b. cars San Francisco.	

Bailey Construction Co. Los Angeles and San Francisco out-of-stock prices remain firm at 2.50c., base, on carload lots. Merchant steel bars move in small lots only. On this class of material, 2.10c. to 2.20c., c.i.f., appears to be general.

Plates

A number of small plate projects were reported booked during the past 10 days, the total exceeding 4000 tons. The Brombacher Iron Works took 150 tons for cell work for the new Los Angeles jail. Bids are being taken on 250 tons for a tugboat for Honolulu interests. Two steel standpipes for Seattle will require 110 tons. The Steel Tank & Pipe Co. was low bidder on 390 tons of 24-in. welded steel pipe to be fabricated from ¼-in. material. Prices range from 2.05c. to 2.15c., c.i.f.

Shapes

Only two awards of size are reported. The Wallace Bridge & Structural Steel Co. took 1200 tons for dam gates for a project near Rock Island,

Wash., and the McClintic-Marshall Co. secured 270 tons for an apartment on Green Street, San Francisco. Bids have just been opened on 600 car underframes for the Pacific Fruit Express Co., San Francisco, involving 4500 tons of shapes. Hodges, King & Marble are the low bidders on the Burrard Street bridge, Vancouver, B. C., which will require 3200 tons. An award is expected within the next few days on 1400 tons for the Paramount Theater in Oakland. Shapes range from 2.15c. to 2.25c., c.i.f.

Cast Iron Pipe

Movement was confined to lots of less than 100 tons. Bids have been opened on 105 tons of 4 to 8-in. Class B pipe for Alhambra, Cal., and on 134 tons of 10-in. Class B pipe for Renton, Wash. It is reported that Los Angeles and Long Beach will shortly come into the market for fair-sized tonnages.

Canada

Prospective Railroad Buying Most Promising Sign

TORONTO, Nov. 11.—While the iron and steel industry of Canada shows some indications of early improvement, business continues to run mostly in a rut of depression. The Canadian Pacific Railway has announced plans for an early start on a track-laying program that will involve an expenditure of more than \$11,000,000 and will include the purchase of rails, track fasteners, supplies, etc. The Canadian National Railways will also make a considerable expenditure for construction and will place some large rail contracts. With the exception of the prospective business from the railways, however, there is but little in sight to warrant optimism. The automotive industry is operating on a greatly curtailed basis and is doing little buying. Implement plants are running under 40 per cent.

Pig Iron

No future buying is being done, and spot sales are confined to small lots for the immediate needs of melters. Consumers are operating on a hand-to-mouth basis and under present conditions decline to buy raw material against long-term future needs. Production continues at about 41 per cent of the total capacity of all blast furnaces. Prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75.....	\$22.60
No. 2 fdy., sil. 1.75 to 2.25.....	22.10
Malleable.....	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75.....	\$24.00
No. 2 fdy., sil. 1.75 to 2.25.....	23.50
Malleable.....	24.00
Basic.....	22.50

Structural Steel

This market continues to be the bright spot in the iron and steel industry. Fabricators in the Montreal and Western districts are well booked

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Soft steel bars.....	3.15c.
Reinforcing bars.....	2.95c.
Cold-fin. flats and sq.....	3.65c.
Rounds and hex.....	3.15c.
Cold-rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.60c.
Bands.....	3.50c.
Hoops.....	3.90c.
Blue ann'l'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$2.60
Black wire, base per 100 lb.....	3.20

with orders and are assured of almost capacity operations for some time. In the Toronto district, however, business is somewhat restricted and no large contracts are in prospect. A number of contracts, ranging from 50 to 1000 tons, were placed during the week, but otherwise the market was quiet.

Old Material

Mills are accepting only small quantities of heavy melting steel, and shipments of turnings are negligible. Other steel grades are correspondingly dull. A few small sales were reported in iron grades, but the market as a whole is spotty. Price lists are unchanged.

Dealers' buying prices for old material:
Per Gross Ton

	Toronto	Montreal
Heavy melting steel.....	\$7.00	\$6.00
Rails, scrap.....	7.00	6.00
No. 1 wrought.....	6.00	8.00
Machine shop turnings.....	2.00	2.00
Boiler plate.....	5.00	4.50
Heavy axle turnings.....	2.50	2.50
Cast borings.....	2.00	2.00
Steel borings.....	2.00	2.00
Wrought pipe.....	2.00	2.00
Steel axles.....	7.00	9.00
Axles, wrought iron.....	7.00	11.00
No. 1 machinery cast.....	10.00	
Stove plate.....	8.00	
Standard carwheels.....	8.50	
Malleable.....	8.00	
Per Net Ton		
No. 1 mach'y cast.....	11.00	....
Stove plate.....	9.00	....
Standard carwheels.....	10.00	....
Malleable scrap.....	9.00	....

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock.....	3.60c.
Black sheets (No. 24).....	4.25c.
Galv. sheets (No. 24).....	4.60c.
Blue ann'l'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.10c.
Galv. corrug. sheets.....	4.70c.
Structural rivets.....	4.15c.
Boiler rivets.....	4.15c.
Per Cent Off List	
Tank rivets, $\frac{7}{8}$ -in. and smaller, 100 lb. or more.....	65
Less than 100 lb.....	60
Machine bolts.....	60
Carriage bolts.....	60
Lag screws.....	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

BUFFALO

Pig Iron Melters Buying Only for Nearby Needs—Scrap Weaker

BUFFALO, Nov. 11.—About 5000 tons of pig iron has been sold in the past week. No good-sized orders were involved, nor are there any sizable inquiries out at present. All the orders were for prompt shipment. There seems to be no disposition on the part of melters to buy ahead, though it is fairly certain that stocks of pig iron are at a minimum and that the foundry industry is susceptible to a well defined buying movement whenever business picks up. The Wickwire-Spencer Co. stack is expected to go out of blast about Dec. 1.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.....	\$17.50
No. 2X fdy., sil. 2.25 to 2.75.....	18.00
No. 1 fdy., sil. 2.75 to 3.25.....	19.00
Malleable, sil. up to 2.25.....	18.00
Basic.....	17.50
Lake Superior charcoal.....	27.28

Finished Steel

Mill operations in this district are virtually unchanged. The Lackawanna plant of the Bethlehem Steel Co. is operating 14 open-hearths, while the Donner plant of the Republic Steel Corp. varies from four to five. Wickwire-Spencer is operating two and the Gould Coupler Co. one. Structural steel fabricators are interested in the new Ridge Road bridge at Lackawanna, N. Y., which will require over 2000 tons, as well as 100 to 200 tons of reinforcing bars. It is reported that school No. 64, requiring 150 tons of reinforcing bars, has been let.

Old Material

A local mill today bought 10,000 tons of No. 1 and No. 2 heavy melting steel at \$11.50 for the former and \$10 for the latter. The No. 1 heavy melting steel of the Erie Railroad list,

which closed recently, brought \$12, f.o.b. Erie tracks. Sales of other grades of scrap include 500 to 1000 tons of No. 1 machinery scrap, for which a Buffalo foundry is reported to have paid \$11, delivered, 250 tons of machinery cast to another consumer at \$10.25 and 250 tons of stove plate at \$9.75. A stove plate sale was made at \$9.90, Tonawanda, on an order permitting shipment from down State.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel..	\$11.50
No. 2 heavy melting scrap.....	10.00
Scrap rails.....	\$12.00 to 12.50
Hydraul. comp. sheets.....	10.50
Hand bundled sheets.....	8.00 to 8.50
Drop forge flashings.....	10.50
No. 1 busheling.....	10.50
Hvy. steel axle turnings.....	11.00 to 11.50
Machine shop turnings.....	6.00 to 7.00
No. 1 railroad wrought.....	10.00 to 10.50

Acid Open-Hearth Grades:	
Knuckles and couplers....	14.50 to 15.00
Coil and leaf springs.....	14.50 to 15.00
Rolled steel wheels.....	14.50 to 15.00
Low phos. billet and bloom ends.....	15.50 to 16.00

Electric Furnace Grades:	
Short shov. steel turnings..	8.50 to 9.50

Blast Furnace Grades:	
Short mixed borings and turnings.....	7.00 to 8.00
Cast iron borings.....	7.00 to 8.00
No. 2 busheling.....	7.00

Rolling Mill Grades:	
Steel car axles.....	15.00 to 15.50
Iron axles.....	19.00 to 19.50

Cupola Grades:	
No. 1 machinery cast.....	10.25 to 11.00
Stove plate.....	9.50 to 10.00
Locomotive grate bars.....	8.25 to 9.25
Steel rails, 3 ft. and under.....	15.00 to 15.50
Cast iron carwheels.....	13.50 to 14.00

Malleable Grades:	
Industrial.....	14.00 to 14.50
Railroad.....	14.00 to 14.50
Agricultural.....	14.00 to 14.50
Special Grades:	
Chemical borings.....	11.50 to 12.00

ST. LOUIS

Eight of 37 Open-Hearth Furnaces in District Operating

ST. LOUIS, Nov. 11.—An improvement in shipping orders against contracts for pig iron is reported by the St. Louis Gas & Coke Corp., but little new business is being placed for either Northern or Southern iron. The only important inquiry before the market is for 1500 tons, which likely will go to a Southern maker. Business with the jobbing foundries is said to be slightly better. Plants specializing in malleable castings for the automobile trade are still awaiting a cleaning up of castings on hand before making further commitments for pig iron. Sales of Southern iron have been reported at as low as \$11.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill....	\$17.50
Malleable, f.o.b. Granite City.....	17.50
N'th'n No. 2 fdy., deliv'd St. Louis.....	19.66
Southern No. 2 fdy., deliv'd.....	\$15.42 to 15.92

Northern malleable, deliv'd 19.16 to 19.66
Northern basic, deliv'd.... 19.16 to 19.66

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Finished Steel

A survey of operations of the steel plants in the district reveals that of 37 open-hearth furnaces, only eight are in operation. Specifications against contracts for plates, shapes and bars, which have been at a standstill for several weeks, showed a slight improvement during the last week, but very little new business is being placed. Railroads centering in St. Louis so far have given no indication as to their rail requirements for next year, although orders usually are placed by this time. Warehouse business for October was slightly better than for September, and this month so far has been better than the same

period last month. Territory outside of St. Louis is beginning to show more activity than for some time. Structural steel business is extremely light, and no sizable projects are pending. The only award of the week was 120 tons for an addition to a foundry. Plans for the Merchandise Mart contemplated by the Terminal Railway Association are expected to be submitted shortly. It is expected that this building will require a large tonnage of reinforcing bars.

Old Material

The scrap market continues weak. Mills are not buying, and not much business is expected until after inventory time, when low prices may induce a buying movement to bring down the average prices of raw material on hand. With only eight of the 37 open-hearth furnaces in the district operating, the demand for items for their use is very low. Rolling mills are doing little, and gray iron foundries are said to be operating at only about 25 per cent of capacity. Dealers are beset with instructions from the mills to withhold shipments on one hand and the insistence of railroads on making shipments of purchases to cover contracts on the other. There are only a few price changes.

Railroad lists: Pennsylvania, 25,420 tons; Wabash, 1560 tons; Chicago, Indianapolis & Louisville, 21 carloads, and Chicago & Eastern Illinois, 10 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	\$11.00 to \$11.50
No. 1 heavy melting or shoveling steel	10.00 to 10.50
No. 2 heavy melting or shoveling steel	9.25 to 9.75
No. 1 locomotive tires	11.50 to 12.00
Misc. stand-sec. rails including frogs, switches and guards, cut apart	10.50 to 11.00
Railroad springs	13.00 to 13.50
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought	10.00 to 10.50
No. 1 busheling	7.00 to 7.50
Cast iron borings and shoveling turnings	6.00 to 6.50
Iron rails	10.00 to 11.00
Rails for rolling	12.00 to 12.50
Machine shop turnings	3.50 to 4.00
Heavy turnings	8.00 to 8.50
Steel car axles	15.00 to 15.50
Iron car axles	20.50 to 21.00
Wrot. iron bars and trans.	13.00 to 13.50
No. 1 railroad wrought	8.00 to 8.50
Steel rails, less than 3 ft.	13.00 to 13.50
Steel angle bars	10.50 to 11.00
Cast iron carwheels	11.00 to 11.50
No. 1 machinery cast	10.50 to 11.00
Railroad malleable	10.25 to 10.75
No. 1 railroad cast	10.00 to 10.50
Stove plate	8.50 to 9.00
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	10.00 to 10.50

the Southern Railway is offering 10,000 tons.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	\$10.00 to \$10.50
Scrap rails for melting	11.00 to 11.50
Loose sheet clippings	6.50 to 7.00
Bundled sheets	9.25 to 9.75
Cast iron borings	5.50 to 6.00
Machine shop turnings	6.00 to 6.50
No. 1 busheling	8.50 to 9.00
No. 2 busheling	5.50 to 6.00
Rails for rolling	12.00 to 12.50
No. 1 locomotive tires	13.00 to 13.50
No. 2 railroad wrought	10.00 to 10.50
Short rails	15.25 to 15.75
Cast iron carwheels	11.50 to 12.00
No. 1 machinery cast	14.50 to 15.00
No. 1 railroad cast	12.50 to 13.00
Burnt cast	7.00 to 7.50
Stove plate	7.00 to 7.50
Brake shoes	7.00 to 7.50
Agricultural malleable	12.50 to 13.00
Railroad malleable	13.50 to 14.00

Porcelain Enamel Industry Organizes Institute

The Porcelain Enamel Institute, Inc., was organized on Nov. 6, when a representative group of manufacturers met in Cleveland. The institute, which has been formed for the purpose of promoting the progress and development of the porcelain enameling and allied industries, will immediately be incorporated under the laws of the State of Illinois as a corporation organized not for pecuniary profits.

By-laws of the institute provide for the membership of manufacturers of enameled kitchen utensils, table tops, stoves, refrigerators, signs, tile and washing machine tubs; companies supplying porcelain enameled parts and porcelain enamel service to other manufacturers; companies manufacturing iron and steel for the enameling industry; companies manufacturing porcelain enamel frit and enamel for the industry, and companies producing chemicals and other raw material used in the manufacture of porcelain enameled articles.

The Porcelain Enamel Institute will stimulate and conduct research in connection with the manufacture and marketing of porcelain enameled products and will inform the trade and public as to the results of these investigations. Through education and publicity, it will promote a correct understanding by the public of the properties and advantages of porcelain enamel and will encourage the use of porcelain enamel finishes.

The following were elected officers of the institute: President, R. A. Weaver, vice-president, Ferro Enamel Corp., Cleveland; vice-president, R. W. Staud, Benjamin Electric Mfg. Co., Chicago; secretary-treasurer, W. E. Hogenson, Chicago Vitreous Enamel Products Co., Chicago; executive committee: W. E. Hogenson, Chicago Vitreous Enamel Products Co.; R. W. Staud, Benjamin Electric Mfg. Co.; Bennett Chapple, American Rolling Mill Co., Middletown, Ohio; Russell Greer, Porcelain Enamel & Mfg. Co., Baltimore; Louis Ingram, Ingram-Richardson Mfg. Co., Beaver Falls, Pa.

CINCINNATI Pig Iron Buying Restricted—Sheet Buying in Scattered Small Lots

CINCINNATI, Nov. 11.—With consumers beginning to display the usual seasonal desire to restrict inventories, the district demand for pig iron has declined again. Total sales for the week were 1350 tons. All except three 100-ton orders were carload lots for immediate shipment. Foundries continue to operate a few small heats weekly and, with the holiday season just a few weeks off, the trade feels that no improvement may be expected before the end of January. Two southern Ohio consumers and a western Indiana buyer took 100 tons of Southern iron each. A northern Ohio melter is inquiring for a quantity of Northern foundry iron not to exceed 400 tons.

Prices per gross ton, deliv'd Cincinnati:
So. Ohio fdy., sil. 1.75 to 2.25 \$20.89 to \$21.39
Ala. fdy., sil. 1.75 to 2.25 .. 15.19 to 16.19
Ala. fdy., sil. 2.25 to 2.75 .. 15.69 to 16.69
Tenn. fdy., sil. 1.75 to 2.25 .. 15.19 to 16.19
S'th'n Ohio silvery, 8 per, cent 24.39

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Finished Steel

Demand for finished sheets failed to show improvement last week. Fresh bookings were about on a parity with those of the preceding week. The demand appears to be well diversified and, while the number of orders is good, the quantities are small. Operations of district mills are at less than 50 per cent of capacity.

Coke

New business in the foundry grades of coke is almost negligible and specifications against current contracts are behind last month's.

Old Material

With mills holding up shipments on contracts and new business infrequent, the scrap market continues dull. A fair percentage of scrap purchased by dealers is being piled in the yards. The Louisville & Nashville Railroad is offering a list of about 8000 tons and

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
New billet reinf. bars	3.15c.
Rail steel reinf. bars	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex.	3.80c.
Squares	4.30c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	\$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg ..	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	\$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

▲▲ Semi-Finished Steel, Raw Materials, Bolts and Rivets ▲▲

Mill Prices of Semi-Finished Steel

Billets and Blooms		Sheet Bars		Skelp	
Per Gross Ton		(Open Hearth or Bessemer)		(F.o.b. Pittsburgh or Youngstown)	
		Per Gross Ton		Per Lb.	
Rerolling, 4-in. and under 10-in., Pitts-		Pittsburgh	\$31.00	Grooved	1.60c. to 1.70c.
burgh	\$31.00	Youngstown	31.00	Universal	1.60c. to 1.70c.
Rerolling, 4-in. and under 10-in., Youngs-		Cleveland	31.00	Sheared	1.60c. to 1.70c.
town	31.00	Slabs		Wire Rods	
Rerolling, 4-in. and under 10-in., Cleve-		(8 in. x 2 in. and under 10 in. x 10 in.)		(Common soft, base)	
land	31.00	Per Gross Ton		Per Gross Ton	
Rerolling, 4-in. and under 10-in., Chicago	32.00	Pittsburgh	\$31.00	Pittsburgh	\$36.00
Forging quality, Pittsburgh	36.00	Youngstown	31.00	Cleveland	36.00
		Cleveland	31.00	Chicago	37.00

Prices of Raw Material

Ores		Ferromanganese		Fluxes and Refractories	
Lake Superior Ores, Delivered Lower Lake Ports		Per Gross Ton		Fluorspar	
Per Gross Ton				Per Net Ton	
Old range Bessemer, 51.50% iron	\$4.80	Domestic, 80%, seaboard	\$94.00 to \$99.00	Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	\$18.00
Old range non-Bessemer, 51.50% iron	4.65	Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00	No. 2 lump, Illinois and Kentucky mines	20.00
Mesabi Bessemer, 51.50% iron	4.65	Spiegeleisen		Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	\$17.00 to \$17.50
Mesabi non-Bessemer, 51.50% iron	4.50	Per Gross Ton Furnace		Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silica, f.o.b. Illinois and Kentucky mines	32.50
High phosphorus, 51.50% iron	4.40	Domestic, 19 to 21%	\$31.00 to \$33.00	Fire Clay Brick	
Foreign Ore, c.i.f. Philadelphia or Baltimore		Domestic, 16 to 19%	29.00 to 32.00	Per 1000 f.o.b. Works	
Per Unit		Electric Ferrosilicon		High-Heat Intermediate	
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	8c. to 9c.	Per Gross Ton Delivered		Duty Brick Heavy Duty Brick	
Iron ore, low phos., Swedish, average 68% iron	11c.	50%	\$33.50	Pennsylvania	\$43.00 to \$46.00 \$35.00 to \$38.00
Iron ore, basic Swedish, average 65% iron	9c.	75%	130.00	Maryland	43.00 to 46.00 35.00 to 38.00
Manganese ore, washed 52% manganese, from the Caucasus	26c. to 28c.	Per Gross Ton Furnace		New Jersey	50.00 to 65.00
Manganese ore, Brazilian, African or Indian, basic 50%	26c. to 28c.	10%	\$35.00	Ohio	43.00 to 46.00 35.00 to 38.00
Fungeten ore, high grade, per unit, in 60% concentrates	\$12.00 to \$13.00	11%	37.00	Kentucky	43.00 to 46.00 35.00 to 38.00
Per Gross Ton		Bessemer Ferrosilicon		Missouri	43.00 to 46.00 35.00 to 38.00
Chrome ore, 45 to 50% Cr ₂ O ₃ crude, c.i.f.		F.o.b. Jackson County, Ohio, Furnace		Illinois	43.00 to 46.00 35.00 to 38.00
Atlantic seaboard	\$22.00 to \$24.00	Per Gross Ton		Ground fire clay, per ton	7.00
Molybdenum ore, 85% concentrates of MoS ₂ delivered	50c. to 55c.	10%	\$26.50	Silica Brick	
		11%	28.50	Per 1000 f.o.b. Works	
		12%	30.50	Pennsylvania	\$43.00
				Chicago	52.00
				Birmingham	50.00
				Silica clay, per ton	\$8.50 to 10.00
				Magnesite Brick	
				Per Net Ton	
				Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
				Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
				Standard size	45.00
				Chrome Brick	
				Per Net Ton	
				Standard size	\$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts		Bolts and Nuts		Small Rivets	
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)				(7/8-in. and smaller)	
Per Cent Off List		Per Cent Off List		Per Cent Off List	
Machine bolts	73	Semi-finished hexagon nuts	73	F.o.b. Pittsburgh	70, 10 and 5
Carriage bolts	73	Semi-finished hexagon castellated nuts, S.A.E.	73	F.o.b. Cleveland	70, 10 and 5
Lag bolts	73	Stove bolts in packages, P'gh	80, 10, 10 and 5	F.o.b. Chicago	70, 10 and 5
Plow bolts, Nos. 1, 2, 3 and 7 heads	73	Stove bolts in packages, Chicago	80, 10, 10 and 5	Cap and Set Screws	
Hot-pressed nuts, blank or tapped, square	73	Stove bolts in bulk, P'gh	80, 10, 10, 5 and 2 1/2	(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
Hot-pressed nuts, blank or tapped, hexagons	73	Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2 1/2	Per Cent Off List	
C.p.c. and t. square or hex. nuts, blank or tapped	73	Tire bolts	60, 10 and 10	Milled cap screws	80, 10, 10 and 5
Washers	7.00c. to 6.75c. per lb. off list	Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.		Milled standard set screws, case hardened	80 and 5
		Large Rivets		Milled headless set screws, cut thread	.75 and 10
		(1/2-in. and larger)		Upset hex. head cap screws, U.S.S. thread	85 and 10
		Base per 100 Lb.		Upset hex. cap screws, S.A.E. thread	.85 and 10
		F.o.b. Pittsburgh or Cleveland	\$2.75	Upset set screws	80, 10 and 5
		F.o.b. Chicago	2.85	Milled studs	70

▲▲▲ Mill Prices of Finished Iron and Steel Products ▲▲▲

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
Del'd Philadelphia.....	1.89c.
Del'd New York.....	1.93c.
F.o.b. Cleveland.....	1.60c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
C.i.f. Pacific ports.....	2.10c.
F.o.b. San Francisco mills.....	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.....	1.70c.
F.o.b. Birmingham, mill lengths.....	1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist.....	1.55c.
F.o.b. Chicago Heights mill.....	1.65c.
Del'd Philadelphia.....	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago.....	1.70c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron, del'd Philadelphia.....	2.09c.
Common iron, del'd New York.....	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
Del'd Cleveland.....	1.78 1/2 c.
Del'd Philadelphia.....	1.80 1/2 c.
F.o.b. Coatesville.....	1.70c.
F.o.b. Sparrows Point.....	1.70c.
F.o.b. Lackawanna.....	1.70c.
Del'd New York.....	1.88c.
C.i.f. Pacific ports.....	2.05c. to 2.15c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.60c.
F.o.b. Chicago.....	1.70c.
F.o.b. Birmingham.....	1.75c. to 1.80c.
F.o.b. Lackawanna.....	1.70c.
F.o.b. Bethlehem.....	1.70c.
Del'd Cleveland.....	1.78 1/2 c.
Del'd Philadelphia.....	1.71c. to 1.76c.
Del'd New York.....	1.85 1/2 c.
C.i.f. Pacific ports.....	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh.....	1.70c.
Wider than 6 in., P'gh.....	1.60c.
6 in. and narrower, Chicago.....	1.80c.
Wider than 6 in., Chicago.....	1.70c.
Cooperage stock, P'gh.....	1.90c.
Cooperage stock, Chicago.....	2.00c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill.....	2.00c. to 2.10c.
Bars, f.o.b. Chicago.....	2.00c. to 2.10c.
Bars, Cleveland.....	2.00c. to 2.10c.
Bars, Buffalo.....	2.00c. to 2.10c.
Shafting, ground, f.o.b. mill.....	*2.45c. to 3.40c.
Strips, P'gh.....	2.35c.
Strips, Cleveland.....	2.35c. to 2.45c.
Strips, deliv'd Chicago.....	2.63c.
Strips, Worcester.....	2.50c. to 2.60c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland.....	3.60c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)
To Merchant Trade

	Base per Keg
Standard wire nails.....	\$1.95 to \$2.00
Cement coated nails.....	1.95 to 2.00
Galvanized nails.....	3.95 to 4.05

	Base per Lb.
Polished staples.....	2.40c. to 2.50c.
Galvanized staples.....	2.65c. to 2.75c.
Barbed wire, galvanized.....	2.60c. to 2.70c.
Annealed fence wire.....	2.10c. to 2.20c.
Galvanized wire, No. 9.....	2.55c. to 2.65c.
Woven wire fence (per net ton to re-tailers).....	\$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage.....	2.30c.
Spring wire.....	3.30c.
(Carload lots, f.o.b. Chicago)	
Wire nails.....	\$2.00 to \$2.05
Annealed fence wire.....	2.40c. to 2.50c. (lb.)
Bright hard wire to manufacturing trade.....	2.35c.

Anderson, Ind., mill prices are ordinarily \$1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill \$2 a ton over Pittsburgh, and Birmingham mill \$3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh.....	1.90c. to 2.00c.
No. 10, blue annealed, f.o.b. Chicago dist.....	2.00c. to 2.10c.
No. 10, blue annealed, del'd Phila.....	2.32c. to 2.42c.
No. 10, blue annealed, B'ham.....	2.15c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh.....	2.05c. to 2.15c.
No. 13, f.o.b. Chicago dist.....	2.15c. to 2.25c.
No. 13, del'd Philadelphia.....	2.34c. to 2.44c.
No. 13, blue annealed, B'ham.....	2.30c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.35c. to 2.45c.
No. 24, f.o.b. Chicago dist. mill.....	2.45c. to 2.55c.
No. 24, del'd Philadelphia.....	2.64c. to 2.74c.
No. 24, f.o.b. Birmingham.....	2.60c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh.....	3.60c.
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Galvanized

No. 24, f.o.b. Pittsburgh.....	2.90c. to 3.00c.
No. 24, f.o.b. Chicago dist. mill.....	3.10c.
No. 24, del'd Cleveland.....	3.08 1/2 c. to 3.18 1/2 c.
No. 24, del'd Philadelphia.....	3.24c. to 3.29c.
No. 24, f.o.b. Birmingham.....	3.10c. to 3.15c.

Continuous Mill Sheets

No. 10 gage.....	1.70c. to 1.80c.
No. 13 gage.....	1.85c. to 1.95c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	2.65c. to 2.70c.
No. 28, f.o.b. Chicago dist. mill.....	2.75c. to 2.80c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh.....	3.40c.
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Long Ternes

No. 24, 8-lb. coating, f.o.b. mill.....	3.45c. to 3.55c.
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Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh.....	3.70c.
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Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills.....	\$5.00
Standard cokes, f.o.b. Gary.....	5.10

Terne Plate

(F.o.b. Morgantown or Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C. \$10.30	25-lb. coating I.C. \$15.20
15-lb. coating I.C. 12.90	30-lb. coating I.C. 16.00
20-lb. coating I.C. 14.00	40-lb. coating I.C. 17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.	Alloy Differential
S.A.E. Series	
Numbers	
2000 (1/2% Nickel).....	\$0.25
2100 (1 1/4% Nickel).....	0.55
2300 (3/4% Nickel).....	1.50
2500 (5% Nickel).....	2.25
3100 Nickel Chromium.....	0.55
3200 Nickel Chromium.....	1.35
3300 Nickel Chromium.....	3.80
3400 Nickel Chromium.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45
5100 Chromium Spring Steel.....	0.20
6100 Chromium Vanadium Bar.....	1.20
6100 Chromium Vanadium Spring Steel.....	0.95
9250 Silicon Manganese Spring Steel (flats).....	0.25
Rounds and squares.....	0.50
Chromium Nickel Vanadium.....	1.50
Carbon Vanadium.....	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is 3/4c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2 1/2 in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	34.00
Light (from rail steel), f.o.b. mill.....	32.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

Track Equipment

	Base per 100 Lb.
Spikes, 7/8 in. and larger.....	\$2.80
Spikes, 1/2 in. and smaller.....	2.80

Spikes, boat and barge.....	\$3.00
Tie plate, steel.....	2.07 1/2
Angle bars.....	2.75
Track bolts, to steam railroads.....	\$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Steel		Iron	
Inches	Black	Inches	Black
1/8.....	47	1/4 and 3/8.....	+11 +36
1/4.....	53	1/2.....	28 5
3/8.....	58	3/4.....	28 11
1/2.....	62	1 and 1 1/4.....	31 15
3/4.....	64	1 1/2 and 2.....	35 18
1 to 3.....	64		
2.....	57		
2 1/2 to 6.....	61		
7 and 8.....	58		
9 and 10.....	56		
11 and 12.....	55		

Lap Weld

2.....	45 1/2	2.....	23 9
2 1/2 to 6.....	49 1/2	2 1/2 to 3 1/2.....	28 13
7 and 8.....	45 1/2	4 to 6.....	30 17
9 and 10.....	43 1/2	7 and 8.....	29 16
11 and 12.....	42 1/2	9 to 12.....	26 11

Butt Weld, extra strong, plain ends	
Inches	Black
1/8.....	43
1/4.....	49
3/8.....	55
1/2.....	60
3/4.....	62
1 to 1 1/2.....	61 1/2
2 to 3.....	63

Lap weld, extra strong, plain ends	
Inches	Black
2.....	55
2 1/2 to 4.....	59
4 1/2 to 6.....	58
7 to 8.....	54
9 and 10.....	47
11 and 12.....	46

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1 1/2 points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2 1/2%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2 1/2 points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Charcoal Iron
2 in. and 2 1/4 in.....	38
2 1/2 in.—2 3/4 in.....	46
3 in.....	52
3 1/2 in.—3 3/4 in.....	54
4 in.....	57
4 1/2 in. to 6 in.....	46
1 1/2 in.....	1
1 3/4 in.....	8
2 in.—2 1/4 in.....	13
2 1/2 in.—2 3/4 in.....	16
3 in.....	17
3 1/2 in. to 3 3/4 in.....	18
4 in.....	20
4 1/2 in.....	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:
Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn	
Inches	Black
1 in.....	61
1 1/4 to 1 1/2 in.....	53
1 3/4 in.....	37
2 to 2 1/4 in.....	32
2 1/2 to 2 3/4 in.....	40
3 in.....	52
3 1/4 to 3 1/2 in.....	48
4 in.....	51
4 1/2, 5 and 6 in.....	40

Hot Rolled

2 and 2 1/4 in.....	38
2 1/2 and 2 3/4 in.....	46
3 in.....	52
3 1/4 to 3 1/2 in.....	54
4 in.....	57
4 1/2, 5 and 6 in.....	46

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads).....	55
Carbon, 0.30% to 0.40% base.....	50
Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	

Fabricated Structural Steel

New Projects of 62,000 Tons Include Subways and Elevated Highway in New York—Awards 35,000 Tons

NEW fabricated steel projects of 62,000 tons are smaller than those of a week ago, when the total was 104,000 tons, but the week is among the best of the year. Included in inquiries are 15,000 tons for a section of the West Side elevated highway in New York, to be built by the New York Central Railroad; 10,000 tons for aircraft hangars, on which the United States Army is preparing plans; 14,800 tons in two subway sections in New York; 2000 tons for an apartment building on Central Park South, New York, and 2300 tons in buildings for the electrical group at the Chicago World's Fair.

Awards totaling 35,000 tons compare with 32,000 tons a week ago. Included are 12,500 tons in a New York subway section, 2500 tons in a Philadelphia subway section and 5000 tons in the Western Hills viaduct, Cincinnati. Awards follow:

North Atlantic States

WORCESTER, MASS., 170 tons, State normal school, to Eastern Bridge & Structural Co.
 SAYLESVILLE, R. I., 360 tons, textile finishing plant, to James H. Tower Iron Works.
 BOSTON, 246 tons, school, Jamaica Plain district, to New England Structural Co.
 MAINE CENTRAL RAILROAD, 325 tons, two bridges, to Phoenix Bridge Co.
 ATTLEBORO, MASS., 125 tons, State bridge, to Boston Bridge Works, Inc.
 PITTSFIELD, MASS., 1412 tons, transformer plant for General Electric Co., to American Bridge Co.
 YONKERS, N. Y., 275 tons, bridge, to McClintic-Marshall Co.
 MIDDLETOWN, N. Y., 300 tons, highway bridge, to American Bridge Co.
 NEW YORK, 12,500 tons, route 108, section 6, Queens subway, to McClintic-Marshall Co.; George H. Flynn, general contractor.
 NEW YORK, 1350 tons, hotel, 400 East Fifty-second Street, to an unnamed fabricator.
 NEWARK, N. J., 1500 tons, Iron Bound Apartment for the Prudential Insurance Co., to Hay Foundry & Iron Works.
 PHILADELPHIA, 2500 tons, Pennsylvania Avenue subway, to Phoenix Bridge Co.; George F. Dobbin, contractor.

The South

BAYTOWN, TEX., 500 tons, power house for Humble Oil & Refining Co., to an unnamed fabricator.

Central States

STATE OF MICHIGAN, 450 tons, two highway bridges, to Whitehead & Kales Co.
 WABASH RAILROAD, 200 tons, two bridges, to McClintic-Marshall Co.
 CINCINNATI, 5000 tons, Western Hills viaduct, to McClintic-Marshall Co.
 TOLEDO, 325 tons, two buildings for Gulf Refining Co., to McClintic-Marshall Co.
 EVANSTON, ILL., 400 tons, Milwaukee Road, to Worden Allen Co., previously reported to an unnamed bidder.
 BLOOM TOWNSHIP, ILL., 500 tons, high school, to Anderson Iron Works.
 CHICAGO, 300 tons, building for University of Chicago, to Union Foundry Co.
 CHICAGO, 1100 tons, theater on Sixty-third Street, to Gage Structural Steel Co.
 AURORA, ILL., 250 tons, theater, to Gage Structural Steel Co.
 STATE OF MINNESOTA, 275 tons, highway bridges, to American Bridge Co.
 ST. LOUIS, 120 tons, addition to foundry for Century Electric Co., to Superior Structural Steel Co.

Western States

STATE OF WASHINGTON, 650 tons, power plant, to Milwaukee Bridge Co., for Stone & Webster Engineering Co., Boston.
 SAN FRANCISCO, 270 tons, apartment building, Green Street, to McClintic-Marshall Co.
 LOS ANGELES, 1700 tons, plates, 38 and 54-in. welded steel pipe for city, to Western Pipe & Steel Co.
 LOS ANGELES, 150 tons, plates and bars for steel cell work for new jail, to Brombacher Iron Works.
 ROCK ISLAND, WASH., 1200 tons, dam gates, to Wallace Bridge & Structural Steel Co.

Canada

PARIS, ONT., 1000 tons, bridge over Grand River, to Standard Steel Construction Co., Port Robinson, Ont.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

STATE OF MASSACHUSETTS, 200 tons, State bridges at Palmer and Monson.
 PROVIDENCE, R. I., 131 tons, Jewish home.
 FALL RIVER, MASS., 130 tons, city water tank.
 NEW YORK, 700 tons, apartment building at 850 Amsterdam Avenue for Nathan Korn.
 NEW YORK, 15,000 tons, section 3, express highway for New York Central Railroad; bids to be taken Nov. 18.
 NEW YORK, 5100 tons, subway route 107, section 8, all bids rejected; new bids taken Nov. 25.
 NEW YORK, 9700 tons, route 108, section 9, Queens subway; bids opened Nov. 21.
 NEW YORK, 2000 tons, Hampshire House Apartment Hotel, Central Park South; H. K. Ferguson Co., general contractor.
 BROOKLYN, 1000 tons, Harway Avenue bridge.
 OLEAN, N. Y., 500 tons, building for Niagara-Hudson Power Co.
 AUBURN, N. Y., 500 tons, power house, cell blocks and kitchen for State prison.
 OCEAN CITY, N. J., unstated tonnage, St. Augustine's Roman Catholic Church.
 WILKINSBURG, PA., 250 tons, Warner Brothers theater.
 PITTSBURGH, 250 tons, Nurses' Home for Pittsburgh Hospital.
 WASHINGTON, 10,000 tons, aircraft hangars for Army; call for bids in about two weeks.
 BALTIMORE, 400 tons, East Baltimore Colored High School.

STATE OF MARYLAND, 350 tons, highway bridge at Furnace Ford, Md.

Central States

PAINESVILLE, OHIO, 350 tons, State highway bridge.
 STATE OF IOWA, 750 tons, highway bridges.
 CHICAGO, 2300 tons, World's Fair electrical group; all bids rejected and plans to be revised.
 WAUKEGAN, ILL., tonnage being estimated, addition to power house for Public Service Co. of Northern Illinois.
 ROCK ISLAND, ILL., 750 tons, 10 barges for United States Engineer; bids close Nov. 25.
 PEORIA, ILL., 500 tons, wharf boat for city of Peoria; bids close Nov. 25.
 MILWAUKEE ROAD, 1400 tons, bridge at Moseby, Mo.

Western States

BARTLESVILLE, OKLA., 3000 tons, tanks for Phillips Petroleum Co.
 OKLAHOMA CITY, 3900 tons, First National Bank.
 PHOENIX, ARIZ., 900 tons, bank.
 OMAHA, NEB., 400 tons, Creighton Avenue bridge for Union Pacific Railroad.
 SEATTLE, 3000 tons, assembling plant for Ford Motor Co.
 SEATTLE, 250 tons, plates, tug boat for a Honolulu interest; bids opened.
 SEATTLE, 110 tons, plates, two standpipes; bids being taken.
 OAKLAND, CAL., 390 tons, plates, 24-in. welded steel pipe, East Bay Municipal Utility District; Steel Tank & Pipe Co., low bidder.
 PASADENA, CAL., 1300 tons, auditorium.

Canada

CANADIAN PACIFIC RAILROAD, 1265 tons, bridge for Moosehead Division.
 QUEBEC, 500 tons for Canadian National Railways subway on Canadiere Road.
 FALCONBRIDGE, ONT., 100 tons, plant addition for Falconbridge Nickel Mines, Ltd.

Export

HAVANA, CUBA, 400 tons, building for Swift & Co.
 RIO SONORA, MEXICO, 500 tons, building.

Symposium on Structural Welding Planned

A special meeting on the "Status of Structural Welding Throughout the United States from the Standpoint of Application and Regulation" will be held Nov. 18, 7.45 p. m., at the Engineering Societies Building, 39 West Thirty-ninth Street, New York. The meeting is under the committee on building codes of the American Welding Society.

General explanation of the welding society's welding code by Prof. F. P. McKibben, consulting engineer, General Electric Co., will be followed by an illustration by G. D. Fish, consulting engineer, Westinghouse Electric & Mfg. Co., of the application of the code to a multi-story building presumed to be erected within municipal building code jurisdiction.

The program includes an illustrated review of structural welding in buildings and bridges throughout the United States, and reports will be made on the progress of the adoption of structural welding by cities and towns and on accrued welding tonnage in buildings and bridges.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Firm — Tin Lower and Inactive—Lead Steady —Zinc Higher

NEW YORK, Nov. 11.

Copper

The situation in the copper market is one of the strangest as well as one of the most interesting that has ever existed. Despite the fact that American producers have large stocks to get rid of, practically every one of them today is declining domestic business. It is admitted that large quantities of electrolytic copper have been sold for delivery as far ahead as March, with probably some sold for April and perhaps even May. Sales to foreign consumers are going along about as usual, though even in this case there is some holding back of metal. Foreign sales thus far this month have been 35,000 tons, which is over half the total sales for October when they were 67,500 tons.

The future of the market depends almost entirely on the present negotiations between African, American and Canadian producers, looking to a fairly large curtailment in world output. Present indications are that these will be successful, but just when a decision will be reached is uncertain because of the many conflicting claims which must be adjusted. Should a favorable decision be reached, higher prices are not improbable, but if the contrary is the case the market may go lower.

Prices for electrolytic copper are nominally very firm at 9.50c., delivered in the Connecticut Valley, with the quotation of Copper Exporters, Inc., at 9.80c., c.i.f. usual European ports. Lake copper is exceedingly firm, at 9.50c. to 9.62½c., delivered. Statistics for October, which will be out in a day or two, are expected to show an increase in stocks of refined metal.

Tin

Buying of spot Straits tin has been exceedingly light. About 100 tons was sold on Wednesday, Nov. 5, mostly to dealers, and about 100 tons changed hands yesterday, consumers taking part of this. On other days there were practically no sales. Despite the low prices, there is very little incentive to buy because consumers are apparently pretty well covered ahead.

Prices have continued to fall and are slightly lower than a week ago, with spot Straits tin quoted today at 25.12½c., New York, and with a few sales reported. Quotations in London are about £2 a ton less than a week ago, with spot standard quoted at £111 10s., future standard at £112 17s. 6d., and spot Straits at £116 5s. The Singapore price today was about £5

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Nov. 11	Nov. 10	Nov. 8	Nov. 7	Nov. 6	Nov. 5
Lake copper, New York.....	9.62½	9.62½	9.62½	9.62½	9.62½	9.62½
Electrolytic copper, N. Y.*.....	9.25	9.25	9.25	9.25	9.25	9.25
Straits tin, spot, N. Y.....	25.12½	25.50	.....	25.50	25.75	25.60
Zinc, East St. Louis.....	4.37½	4.37½	4.40	4.40	4.40	4.40
Zinc, New York.....	4.72½	4.72½	4.75	4.75	4.75	4.75
Lead, East St. Louis.....	4.95	4.95	4.95	4.95	4.95	4.95
Lead, New York.....	5.10	5.10	5.10	5.10	5.10	5.10

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

a ton less than a week ago at £117 10s. The market as a whole is steady and drifting, with the London market quiet and with prices both over there and here within a narrow range. Stocks in British warehouses on Saturday, Nov. 8, were 23,335 tons, a decrease of 415 tons for the week, due partly to a shipment of 400 tons to New York on the Baltic.

Lead

In a moderately active market, prices are firm and unchanged at 4.95c., St. Louis, and 5.10c., New York, which is the contract price of the American Smelting & Refining Co. Demand is confined largely to carload and small lots for early delivery, with sales being made for December shipment. Some large consumers are inquiring for fairly large lots for de-

livery in the first quarter, but these do not interest producers.

Zinc

A further advance during the week carried the price of prime Western zinc to 4.40c., East St. Louis, but this held for only a short time. Some sales were made at this level. Due partly to the announcement of statistics for October and to other causes, the market softened and the metal today is quoted at 4.37½c., East St. Louis, or 4.72½c., New York, with demand only moderate. Statistics for October showed an increase in stocks of refined metal of about 8000 tons, bringing the total to over 141,200 tons, which is the largest in a great many years.

Ore prices are unchanged at \$26 a ton, Joplin, with sales for the week

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	16.50c.
Copper, hot rolled, base sizes.....	19.50c.
Copper, cold rolled, 14 oz. and heavier, base sizes.....	21.50c.
Seamless Tubes—	
Brass	21.50c.
Copper	21.75c.
Brass Rods	14.87½c.
Brazed Brass Tubes.....	24.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open.....	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	28.00c. to 29.00c.
Tin, bar	30.00c. to 31.00c.
Copper, Lake	11.00c.
Copper, electrolytic	10.75c.
Copper, casting	10.50c.
Zinc, slab.....	5.75c. to 6.75c.
Lead, American pig.....	6.00c. to 7.00c.
Lead, bar	8.00c. to 9.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure).....	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ⅓	19.50c. to 20.50c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	30.50c.
Tin, bar	32.50c.
Copper, Lake	10.63c.
Copper, electrolytic	10.63c.
Copper, casting	10.38c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig.....	5.75c. to 6.00c.
Lead, bar	8.50c.
Antimony, Asiatic	11.50c.
Babbitt metal, medium grade.....	15.25c.
Babbitt metal, high grade.....	35.00c.
Solder, ½ and ⅓	19.75c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses. (Prices quoted are nominal. Holders of metal are generally unwilling to part with stock at present low levels.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.75c.	8.50c.
Copper, hvy. and wire	7.25c.	8.25c.
Copper, light and bottoms	6.75c.	7.50c.
Brass, heavy	4.50c.	5.50c.
Brass, light	3.50c.	4.50c.
Hvy. machine composition	7.00c.	8.00c.
No. 1 yel. brass turnings	5.00c.	5.50c.
No. 1 red brass or compos. turnings..	6.25c.	7.25c.
Lead, heavy	4.00c.	4.50c.
Lead, tea	2.50c.	3.00c.
Zinc	2.25c.	2.75c.
Sheet aluminum.....	7.50c.	9.50c.
Cast aluminum.....	6.50c.	8.50c.

ended Nov. 8 at 5740 tons and with output reported at 8150 tons, bringing the estimated surplus at about 41,500 tons. The mining interests feel that they should have a higher price due to the advance in the metal, but it is generally believed that curtailment on their part will be necessary to realize this desire.

Antimony

This market is dull and inactive, with Chinese metal quoted at 7.10c., New York, duty paid, for spot and at 7c. for futures.

Nickel

Long-established prices still rule, with wholesale lots of ingot nickel quoted at 35c. a lb., shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Nov. 11.—Sales are steady after having shown moderate gains in recent weeks. The old metal market is holding the activity gained a week ago.

Prices per lb. in carload lots: Lake copper, 9.75c.; tin, 26.50c.; lead, 5.05c.; zinc, 4.30c.; in less-than-carload lots, antimony, 8.37½c. On old metals we quote copper wire, crucible shapes and copper clips, 7.50c.; copper bottoms, 6.50c. to 7c.; red brass, 6.50c. to 7c.; yellow brass, 4.50c. to 5c.; lead pipe, 3.75c. to 4c.; zinc, 1.50c. to 1.75c.; pewter, No. 1, 15c.; tin-foil, 16c.; block tin, 22c.; aluminum, 6.50c. to 7c.; all being dealers' prices for less-than-carload lots.

Detroit Scrap Market Still Weak

DETROIT, Nov. 11.—The scrap market is drifting. Heavy melting steel is holding up well on account of boat shipments to Eastern mills. Otherwise, prices are soft, with some items down 25c. a ton.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	\$10.00 to \$10.50
Borings and short turnings	4.50 to 5.00
Long turnings	4.00 to 4.50
No. 1 machinery cast	10.00 to 10.50
Automotive cast	11.75 to 12.25
Hydraul. comp. sheets	9.75 to 10.25
Stove plate	7.50 to 8.00
New No. 1 busheling	8.50 to 9.00
Old No. 2 busheling	3.75 to 4.25
Sheet clippings	7.00 to 7.50
Flashings	8.75 to 9.25

A 32 per cent increase in specifications for rustless steel in October is reported by the Republic Steel Corp., which states that inquiries for rustless steel have steadily increased the past two months, indicating growing interest in this metal from aviation, automotive and building industries.

Railroad Equipment

Chicago & Illinois Midland Inquires for 800 Cars

RAILROAD equipment inquiry, which for months has been confined to small lots, is further increased this week by the request of the Chicago & Illinois Midland for prices on 800 cars. This inquiry, with that of the Santa Fe for 1522 cars, instead of 2300, as estimated last week, makes the largest volume of business that car builders have been called upon to consider for some time. The Virginian Railway has awarded contract for 600 cars. Details of railroad equipment business follow:

Formal inquiry of the Santa Fe does not specify the number of cars that were reported last week. The inquiry calls for 1000 50-ton box cars, 400 40-ton refrigerator cars, 100 50-ton refrigerator cars and 22 steel caboose cars, a total of 1522. Santa Fe has ordered 10 horse express cars from Pullman Car & Mfg. Corp.

Chicago & Illinois Midland has inquired for 800 cars as follows: 200 70-ton steel flat-bottom gondolas, 200 50-ton steel self-clearing hopper cars, 200 70-ton steel self-clearing hopper cars and 200 50-ton double-bottom steel gondola cars.

Virginian Railway has awarded an order to the Virginia Bridge & Iron Co. for 600 55-ton hopper cars, which will be mostly new, though some reclaimed material will be used.

New York Central is inquiring for 20 motor passenger car bodies.

Reinforcing Steel

Awards and New Projects in Small Volume

REINFORCING steel awards the past week were light, totaling only 3800 tons, compared with 7600 tons the previous week. Except for 1100 tons for subway work in New York and 800 tons for a factory at Camden, N. J., for the Campbell Soup Co., lettings ranged from 100 to 325 tons. New inquiries call for 2700 tons, of which 1000 tons will be used in the West Street elevated highway in New York. Awards follow:

PORTLAND, ME., 125 tons, tank foundation for Texas Corp., to Kalman Steel Co.
NEW YORK, 1100 tons, subway route 108, section 6; placed by George H. Flinn Corp., New York, with McClintic-Marshall Co.

BROOKLYN, 100 tons, Brighton Beach baths, to Igoe Brothers.

WESTCHESTER COUNTY, N. Y., 105 tons, undercrossing, Saw Mill River Parkway; placed by Petro Luciano & Son, Inc., White Plains, N. Y., with Truscon Steel Co.

WESTCHESTER COUNTY, N. Y., 140 tons, paving between Mount Vernon and North Pelham, to Truscon Steel Co.

CAMDEN, N. J., 800 tons, factory for Campbell Soup Co., to Kalman Steel Co.

PITTSBURGH, 200 tons, Federal Reserve Bank building, to Electric Welding Co.

PITTSBURGH, 115 tons, Mount Lebanon High School addition, to Electric Welding Co.

CLEVELAND, 300 tons, Higbee Co. store, to Truscon Steel Co.

HAMILTON, OHIO, 120 tons, bank building, to Pollak Steel Co.

PORTLAND, ORE., 120 tons, bridge over Wilson River, to an unnamed bidder.

PORTLAND, 112 tons, five bridges in Lincoln County, to an unnamed bidder.

LOS ANGELES, 150 tons, new jail, to an unnamed company.

BERKELEY, CAL., 325 tons, building for University of California, to Pacific Coast Steel Corp.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

BOSTON, 250 tons, high school in Jamaica Plain district.

NEW YORK, 1000 tons, extension of West Street elevated highway; general contract bids to be taken in three sections by New York Central Railroad Nov. 18.

BROOKLYN, 500 tons, subway route 107, section 8; bids rejected and revised figures to be taken.

CHICAGO, 215 tons, store at 3129 Lincoln Avenue.

CHICAGO, 660 tons, International House at University of Chicago; plans revised.

CHICAGO, 550 tons, apartment building at South Shore Drive and Seventieth Street.

SEATTLE, 350 tons, garage on Sixth Avenue; general contract to J. W. Bailey Construction Co.

BILLINGS, MONT., 150 tons, Fox theater; bids opened.

LETHBRIDGE, ALTA., 600 tons, grain elevator for Department of Trade and Commerce, Ottawa.

Sheet & Tube Company Aids Youngstown Unemployed

To meet special needs created by the unemployment conditions in Youngstown, the Youngstown Sheet & Tube Co. has developed a plan of its own, which involves the granting of credit at the company stores to needy workers temporarily out of employment and the creation of an emergency relief fund raised and distributed by workers who are employed.

At the stores, credit will be given for groceries and certain items of clothing to needy employees. The relief fund is raised by voluntary contributions, and will be distributed to those needing groceries, to pay gas and electric bills, rent in extreme cases, and clothing.

The plan has the sanction of the company management, says President Frank Purnell, and, while at present limited to the company's plants in the Youngstown district, will be extended to its other properties.

The company developed a plan of rotating jobs some time ago, so as to distribute work among as large a number of men as possible. The relief measures are designed for the winter months and the plan will be abandoned as soon as employment conditions improve. It is being handled by the company through its employees' representation system, in part.

November Automobile Output Likely to Be Above Low Mark of October

DETROIT, Nov. 10.

ALTHOUGH Detroit thought that automobile production in the United States and Canada during October had set a new low mark for the year, the extent of the decline was somewhat disconcerting. The estimate of the National Automobile Chamber of Commerce for that month was 156,743 cars, which represents a drop of 32 per cent from September. With the exception of last December, when output amounted to only 125,499 units, October showed the poorest performance of any month since December, 1927. Moreover, it was the smallest October for the industry since 1921. In the first 10 months of the current year, production totaled 3,233,256 units, a decline of 39 per cent from the corresponding period last year.

The slump in October is attributed almost entirely to a decrease in assemblies by the Ford Motor Co. and to the fact that Chevrolet was delayed in getting under way on its new models, its operations last month having been greatly curtailed. It was not until the last few days of October that the new cars began coming off assembly lines. Chevrolet's November program calls for 50,000 units or more. Therefore, unless Ford's operations should drop precipitately, a development which is not likely, Chevrolet should be the main factor in bringing the volume this month to a somewhat higher level than in October. This will be contrary to precedent, for November is a seasonally lower production month than October, but observers agree that an upward trend is almost assured. However, this should not be interpreted as meaning the beginning of a steady upward movement for the industry, for December probably will bring another downward turn.

Ford Production Falling Off

In October, Ford manufactured less than 80,000 cars, as against some 97,000 in September. This month's

With exception of last December, October's automobile output for United States and Canada, estimated at 156,743, was poorest month's performance since December, 1927.

* * *

October decline accounted for by drop in Ford and Chevrolet operations.

* * *

With Chevrolet scheduling 50,000 cars or more for November, this month expected to make better showing than October.

* * *

New Chevrolet, priced \$20 to \$40 below former level, shown to Detroiters, Nov. 8.

record is likely to reveal further curtailment, and reports have it that the Rouge plant is scheduled for light operations in December. Stories about Ford's future plans are almost as numerous as were the jokes about the old model T. One of these, going the rounds at the moment, is that a new eight-cylinder car is to be made at the Highland Park plant, from which practically all Ford manufacture has been removed in recent years. Most of these stories are discredited, especially if one takes the trouble to follow them through and learn how few of them are being translated into action.

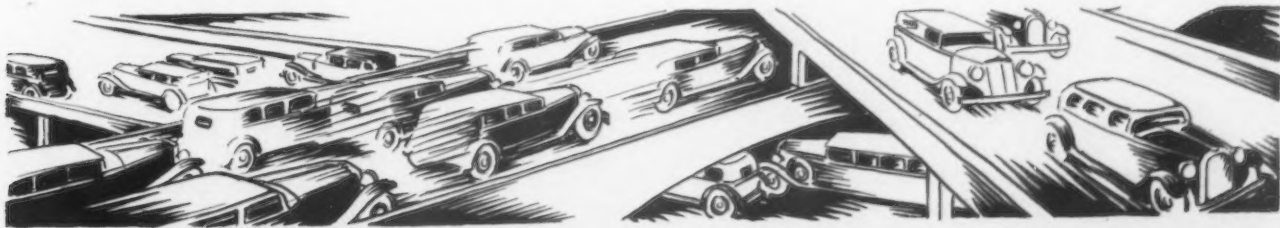
New Chevrolet Attracts Attention

DISCUSSION in automobile circles is centering on the new Chevrolet, which was unveiled to public view by Detroit dealers last Saturday. The main display was in the Chevrolet retail store in the General Motors Building. Chevrolet officials were much encouraged by the large crowds that thronged the store throughout the day. In offering next year's models two months ahead of the annual

New York show, the company is defying tradition. This is partially explained by a statement issued by W. S. Knudsen, president, in which he declares that Chevrolet is running its various plants and also providing work for the Fisher Body factories at a time when such a program will do the most good in providing an income for some 50,000 employees. Aside from this reason, Chevrolet believes that introduction of the new cars will stimulate buying at a time when public interest has sunk into the doldrums. Some people ascribe to Mr. Knudsen an uncanny shrewdness in offering to the public what it wants at the right time, and steel men are hoping that he is correct in his latest venture.

Prices of the 1931 Chevrolet range from \$475, f.o.b. Detroit, for the roadster, to \$650 for the special sedan, representing a reduction of \$20 to \$40 from the previous level. In addition to price changes in the passenger car line, reductions have been made in commercial cars. The commercial chassis has been decreased \$10 to \$355 and the sedan delivery \$20 to \$575. The effect of marketing a larger, more powerful car at lower prices is causing much speculation. The automobile trade would not be surprised to see, as one result, a drop in Ford prices. Some automobile authorities predict a war in the low-price class. While there are differences of opinion in regard to such development, observers are agreed that 1931 will be a year of increasing competition during which some of the smaller companies will either be merged with larger producers or will be forced out of business.

The new Chevrolet is 2 in. longer, having a wheelbase of 109 in., and in head-on appearance somewhat resembles the LaSalle. New treatment of the radiator shell makes it seem much higher and the sides have more curvature. Chromium plating has been more extensively used than heretofore. All sport models are equipped with a chromium plated radiator grill. The



new bodies have a raised belt line to emphasize the low appearance of the car achieved by deeper side body panels with their slight outward bulge. A chromium plated tie-bar arches from fender to fender across the front of the radiator, holding in position the head lamps and the horn, which is mounted just beneath the left head lamp. The rear end of the body has been improved by a newly designed panel concealing the rear cross member and the gas tank. The 50-hp. valve-in-head six-cylinder engine introduced by Chevrolet two years ago is retained. Ribs added to the cylinder block give a 43 per cent increase in rigidity with only 1½ per cent increase in weight. The strength of the crankshaft has been enhanced by the addition of metal in the short arms. During the past season a ring gear of high-carbon steel for the first time was securely welded to the flywheel. This method of construction is continued in the new car. The frame of the car has been redesigned with more metal used at advantageous points to give greater safety and rigidity. While much emphasis has been put on refinements which result in a smarter looking car, the company stresses the fact that fundamentally the new models embody the same basic features which have contributed to the success of previous cars.

Hudson Expands Activities

MORE than 1500 employees of the Hudson Motor Car Co. returned to work the past week, 1000 additional men will be needed next week and a like number the following week. Only old employees are returning at this time, when the Hudson plant is turning out samples for its 1931 car, which will be disclosed to the public the latter part of this month. The Oakland-Pontiac division of General Motors is preparing new models which may be announced as early as Dec. 1. What is purported to be a 12-cylinder Lincoln is said to be in the making, but the date of its public announcement is not yet known. The new 16-cylinder Marmon will not be shown prior to the New York show and no deliveries are likely to be made before February. The new Reo is not selling as well as anticipated and consequently it is understood that production has been cut.

Concurrent with the commencement of production on new Hudson and Essex models, the Hudson Motor Car Co. has announced adoption of a five-day working week. Hudson officials are said to see many advantages not only in manufacturing economies, but in furnishing employment for a larger number of men.

Three more vessels for the Ford Great Lakes fleet will be ready within 60 days, according to current reports. They have been reconditioned from boats purchased from the United States Shipping Board. This leaves only one boat unused, either in shipping or conversion into scrap metal, of the 199 originally purchased.

Ryerson to Give Lectures on Rustless Steels

An educational lecture on rustless steels, alloy steels and tool steels, prepared by the Joseph T. Ryerson & Son Co. for its own employees, has been



G. VAN DYKE

arranged for the benefit of customers and their engineers, superintendents and shop men, and will be delivered in various principal cities throughout the country.

Originally requiring about two

days, the lecture has been boiled down to about three hours, with an additional two hours devoted to demonstrations and instruction, including welding. The lecture gives the general background of the rustless steel alloys and classifications of the various analyses, such as high-carbon rustless steels, low-carbon rustless steels, high-chrome rustless steels and the chrome-nickel varieties. The various characteristics of these different products, such as corrosion resistance, machinability, formability, weldability and resistance to scaling, are discussed. The fabrication of the "18-8" alloys is covered in considerable detail, explanations being given of their application in various industries.

Samples of white pickled and polished sheets, cold-rolled strips, screws, nuts and wire are shown at each lecture, and there are also samples of the materials in fabricated form to illustrate such operations as deep drawing, polishing, etching and welding.

An important feature of the lecture is the use of high-temperature resisting alloys at elevated temperatures both in regard to physical properties, resistance to oxidation or scaling and creep values.

The lecture is presented by G. Van Dyke, manager of the special steels department of the Ryerson warehouses. The Ryerson company will arrange for the presentation of the lecture and demonstration upon request of groups in various districts.

Northern Furnaces Protest Southern Pig Iron Rates

WASHINGTON, Nov. 11.—Complaint was filed last week with the Interstate Commerce Commission by the Hanna Furnace Co. and other pig iron producers in the North against so-called low rates on that product from furnaces in Alabama and Tennessee. The complaint is directed against rail-and-water and rail-water-and-rail rates carried in Speiden tariffs, one of which became effective Aug. 1, 1929, and the other June 13, 1929. The former covers rates to New England and North Atlantic Coast destinations and the latter tariff applies proportional rates to Atlantic and Gulf Coast ports for coastwise movement by water.

The complaining furnaces contend that the rates have made it possible for the Southern producers to ship iron into the destination markets, although the Southern producing points are much farther distant than the complainants' shipping points.

The Hanna company complaint was made on behalf of its furnace at Buffalo. The other complainants include the Interlake Iron Corp., with a furnace at Erie, Pa.; the Adrian Furnace Co., with a furnace at DuBois, Pa.; the Punxsutawney Furnace Co., Punxsutawney, Pa., and the Wick-

wire Spencer Steel Co., Buffalo, N. Y.

Declaring that the reduced rates from Southern producing points to destination territory are lower than the all-rail rates from the origin points, the complaint charges they are in violation of the Interstate Commerce act and give undue preference and advantage to the Southern furnaces. The commission was asked to prescribe just and reasonable rates from the Southern points to the market territory.

The complaint points out former and present rates from Birmingham to various destinations, and, as an example, shows that the present rate to Philadelphia is \$5.25, while before Aug. 1, 1929, it was \$6.01. To Virginia points the coastwise rail-water rate now is \$3.50, reduced from \$4.62 on June 13, 1929. This rate covers wharfage. Rates 35c. a ton higher are published to cover handling charges from cars into barges. In the comparisons with all-rail rates from Northern furnace points, the complaint shows that the rate from Buffalo to Philadelphia is \$4.90.

Beall Pipe and Tank Corp., Portland, Ore., has received an order for 75,000 ft. of 24-in. electric arc welded pipe for a municipal water system in the Pacific Northwest.

Government Asks Bids on 35 Ships for Scrap

WASHINGTON, Nov. 11.—It is estimated that approximately 130,000 gross tons of steel scrap will be recovered from the 45 Government-owned vessels of 356,350 deadweight tonnage, which the Shipping Board has announced will be sold for dismantling and scrapping or for conversion to barges. Bids are to be opened Dec. 10.

Specifications for bids require that work of dismantling shall be begun immediately upon award of sale, which will be made only to American citizens with the stipulation that the work be done within the continental limits of the United States. The board estimates that scrapping of the ships will engage the services of from 300 to 500 workers throughout the 24-month period allowed by the board for completion of the contract.

Twenty-two of the ships are at Norfolk, Va., 16 at New York and seven at Philadelphia. In view of the weak scrap market, surprise was occasioned by the board's statement that improved conditions in the scrap market made an offer of sale seem advisable at this time.

Black Sheet Extras Are Revised

A large sheet producer has revised width and length extras on all black, hot-rolled pickled and pickled cold-rolled sheets, changing the divisions of gages and in certain instances reducing the width extras by about one-half. Other sheet mills are expected to follow in adopting the new extras.

On Nos. 23 and 24 gage the former extra for 36 to 38 in. wide was 40c. The new classification is 36 to 40 in. wide and the extra is 20c. For the same gages, the former extra on 40 to 42 in. wide was 80c. and is now 40c. On extra wide sheets a revision of classification is made.

Similar revisions of classifying the

gages taking width extras has been made in strip steel. As yet no revision of the extras on galvanized sheets has been made, so that in certain instances the width extras are considerably higher than on black.

The extras for drawing quality have also been changed. The former extras of 25c. for deep drawing and 50c. for extra deep drawing material were recently revised to a single charge of 35c. for either. The new extras are 15c. a 100 lb. for 12 gage and heavier, 25c. for Nos. 13 to 21 gage inclusive and 35c. extra for No. 22 gage and lighter sheets. The new extras are given at bottom of page.

Inland Steel Employees Offer Relief To Idle

Employees of Inland Steel Co., Chicago, have developed a plan for the relief of their fellow workers for whom no employment can be provided under present conditions.

Although the company has prorated work among the largest possible number of employees, current volume of business does not permit the retention of all of the regularly employed workers on the payroll. Those who are employed have voluntarily pledged a portion of their earnings to a relief fund, and the company has agreed to contribute an equal amount. The contribution of the employees varies with their earnings from about 2 to 5 per cent. Employees earning less than \$125 a month have not been asked to contribute, except single men with no dependents.

To distribute the money so collected, arrangements have been made to secure the services of trained social workers who will act as visitors and advisers to the central committee of the employees.

The expense incurred in the distribution of the relief fund will be borne by some of the executives of Inland Steel Co., thereby permitting all the money contributed for relief to be used for this purpose.

Philadelphia Steel Club Elects Officers

At a luncheon meeting, Nov. 10, the Steel Club, Philadelphia, elected the following officers for the coming year: President, S. H. Baker, Sharon Steel Hoop Co.; vice-president, Horace W. Merriman, Alan Wood Steel Co.; secretary-treasurer, F. L. Stephenson, Bethlehem Steel Co. On the board of governors are Alexander Cameron, Lukens Steel Co., and W. O. Lange, Phoenix Iron Co.

Suggests Stock Orders for Next Six Months

WASHINGTON, Nov. 11.—The placing of orders for six months for materials needed for repairs to cars has been proposed by the Union Tank Car Co., Chicago, as a means of relieving the unemployment situation. The proposal was made in a letter written by President L. J. Drake of that company to Capt. F. Lucey, president, Lucey Petroleum Co., Dallas, Tex., who is regional director in the Southwest for the Unemployment Committee. The plan has met with such apparent wide approval that Col. Arthur Woods, chairman of the committee, had copies of Mr. Drake's letter made public.

Manganese Producers Again Discuss Soviet "Dumping"

WASHINGTON, Nov. 11.—Alleged dumping of manganese ore into the United States from Soviet Russia made up the main theme of discussion at the third annual convention of the American Manganese Producers' Association at a two-day session ended today. It was charged by members of the association that the domestic industry is paralyzed by imports from Russia. There was an attendance of about 60.

Width Extras for All Black, Hot-Rolled Pickled, and Pickled Cold-Rolled Sheets and Strip																									
Widths U. S. S.	Over															Under									
	32	36	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	24	12	6	3	2	to	to
Gage	Inc.															Inc.									
	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
16 and heavier	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.10	0.20	0.40	0.80	1.30	...	...
17-18	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.55	0.65	0.75	0.85	0.95	1.05	0.15	0.25	0.50	1.00	1.50	...	...
19-21	0.15	0.20	0.25	0.30	0.35	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	0.15	0.25	0.50	1.00	1.50	...	...
22	...	0.20	0.40	0.40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.15	0.25	0.50	1.00	1.50	...	...
23-24	...	0.20	0.40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.15	0.25	0.50	1.00	1.50	...	...
25-27	...	0.20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.20	0.30	0.60	1.25	1.75	...	...
28-30	0.10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.20	0.30	...	...	...	...	...

Length Extras for All Black, Hot-Rolled Pickled, and Pickled Cold-Rolled Iron and Steel Sheets															Under				
Lengths U. S. S.	Over										Under								
	124	144	168	192	204	216	228	60	30	18	10	to	to	to	to				
Gage	Inc.										Inc.								
	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.				
16 and heavier	...	0.50	0.75	1.00	1.00	1.50	2.00	0.10	0.15	0.25	0.45	...	...	...	...
17-18	...	0.10	0.50	0.75	1.00	...	...	0.15	0.25	0.35	0.55	...	...	...	...
19-22	...	0.10	0.50	0.75	1.00	...	...	0.15	0.25	0.35	0.55	...	...	...	...
23-24	...	0.10	0.50	0.75	1.00	...	...	0.15	0.25	0.35	0.55	...	...	...	...
25 and lighter	0.10	...	...	...	...	...	...	0.20	0.30	0.40	0.60	...	...	...	...

The above extras for width and length apply on any sheet not exceeding 40 sq. ft. in area.

OBITUARY

ADDISON HERBERT BEALE, president of the A. M. Byers Co., Pittsburgh, whose sudden death at Chicago on Oct. 28 was mentioned previously in *THE IRON AGE*, had been prominently identified with the iron and steel industry for nearly 30 years. He began his business career with the old Apollo Iron Co., from which he went to the American Sheet Steel Co. at Vandergrift, Pa., as open-hearth superintendent. In 1905 he became general manager of the Eastern Steel Co., but two and a half years later was recalled to the American Sheet & Tin Plate Co. as district manager of the Kiskiminetas Valley plants at Vandergrift, Hyde Park, Leechburg and Saltsburg, Pa. Mr. Beale joined the Mark Mfg. Co. in Chicago in 1918, and was immediately concerned with the construction of a steel mill at Indiana Harbor, Ind. The plant consisted of four open-hearth furnaces, a complete Bessemer department, an 800-ton blast furnace, a 35-in. blooming mill, and plate, merchant and pipe mills. At the same time Mr. Beale was also in charge of modernization work in the Bessemer and blast furnace department of the Iroquois Iron Works at South Chicago. When these plants were merged in the Steel & Tube Co. of America, he continued as vice-president in charge of operations and construction for that company. When the Steel & Tube company became a part of the Youngstown Sheet & Tube Co., Mr. Beale resigned to engage in consulting work, but later became president of the Lebanon Iron Co., Lebanon, Pa. He went with the A. M. Byers Co. as president in 1925, and during the entire term of service was engaged in a modernization program, which culminated with the completion of the new wrought iron plant near Ambridge, Pa., which was dedicated just three weeks before his death.

HARRY F. WAHR, president, Mesta Machine Co., Pittsburgh, died on Nov. 5 at his home in West Homestead, Pa. He was born at Castle Shannon, Pa., in 1884 and was a nephew of the late George Mesta, founder of the company which bears that name. Mr. Wahr attended the Knox Public School in Pittsburgh and the University of Western Pennsylvania, now the University of Pittsburgh, and received a mechanical engineering degree from the latter institution in 1903. Soon afterward he became associated with the Mesta company and served in the engineering and metallurgical departments for a number of years. He then became secretary and later sales manager. When the late Frederick Mesta became president of the company in 1924, Mr. Wahr was elected

vice-president, from which position he succeeded to the presidency in September, 1925.



A. H. Beale



Harry F. Wahr

CHARLES PRENTICE TURNER, formerly chief engineer of the Steelton plant of the Bethlehem Steel Co., died on Oct. 25, aged 68 years. He was graduated from Lehigh University as a mechanical engineer in 1889. He became identified with the Pennsylvania Steel Co. (later a part of the Bethlehem Steel Co.) at its Steelton plant, in 1906. Two years later he was made chief engineer and continued in this capacity until 1926, when he was transferred to the office of the Bethlehem company at Bethlehem, Pa., as engineer in the development and research department.

CHARLES H. BOOTH, for many years an industrial leader of the Mahoning Valley and long associated with James A. Campbell in the affairs of the Youngstown Sheet & Tube Co.,

died of heart disease on Nov. 6, aged 69 years. Ill health caused Mr. Booth to sever all business connections early this year. He was for many years a director of the Sheet & Tube company. He served as vice-president and chairman of the executive committee of the United Engineering & Foundry Co., Pittsburgh, and general manager of its Lloyd Booth plant in Youngstown, founded by his father. In 1917 he retired from active participation in the affairs of the United Engineering company.

FRANK ZUG, for many years identified with the iron and steel industry of the Middle West, died at his home in Youngstown on Oct. 31, aged 66 years. Mr. Zug was secretary of the Ohio Iron & Steel Co. and a director of the Sharon Steel Hoop Co.

FRANCIS J. JESTER, assistant secretary of the United States Steel Corp., and also of its subsidiaries, the American Bridge Co., the United States Steel Products Co. and the Federal Steel Co., died suddenly of heart failure on Nov. 4 at his home at Leonia, N. J. Mr. Jester would have been 46 years old on Dec. 7. He entered the employ of the Steel Corporation on May 17, 1901, six weeks after it was organized. In 1907 he left to become associated with Charles M. Schwab. He returned to the Steel Corporation on May 1, 1908. He was elected assistant secretary on April 25, 1922, and became assistant secretary of the American Bridge Co. and the Federal Steel Co. on April 16, 1928, and assistant secretary of the United States Steel Products Co. on April 15, 1929.

WILLIAM PIEZ, European correspondent for the Link-Belt Co., and a brother of Charles Piez, chairman of the board, Link-Belt Co., died in Brussels, Belgium, Nov. 2, after a week's illness. Previous to his association with Link-Belt Co., Mr. Piez was district manager of the Concrete Steel Co., Chicago. Since 1928 he has lived in Paris, France, where he functioned as European correspondent for the Link-Belt Co. He was born at Newark, N. J., in 1878.

CHARLES M. EDDY, president, R. M. Eddy Foundry Co., Chicago, died on Nov. 10. He was overcome by carbon monoxide gas when working on his car in a closed garage. Mr. Eddy was born 52 years ago at Chicago, where he received his education in the public schools. He became president of the foundry company seven years ago on the retirement of his uncle George D. Eddy.

JOSEPH W. GASKILL, for more than 21 years purchasing agent of John A. Roebling's Sons Co., Trenton, N. J., died at the Hahnemann Hospital, Philadelphia, on Nov. 4, aged 54 years. He had been identified with the company for 24 years.

PERSONALS

CHARLES G. ATKIN, for 11 years Cleveland district manager of Lockwood, Greene Engineers, Inc., has become associated with the H. K. Ferguson Co. as contract engineer with headquarters in Cleveland. He is a native of East Orange, N. J., and in 1911 was graduated from Union College, Schenectady, N. Y.

W. BRUCE PIRNIE has resigned as president of the Cheney Bigelow Wire Works, Springfield, Mass., but remains as a director. H. Y. McMULLEN has succeeded ALEXANDER WARDEN as treasurer of the company.

GREGORY J. COMSTOCK, director of research, Firth-Sterling Steel Co., will speak on "Dies, Die Hardening and the Reason for Die Failures" on Nov. 19 at a meeting of the Rhode Island chapter of the American Society for Steel Treating, Providence.

RALPH E. FLANDERS, manager, Jones & Lamson Machine Co., Springfield, Vt., recently delivered a radio address on "The Machine and the Democratic Ideal" under the auspices of the Museums of the Peaceful Arts, New York.

J. L. OSGOOD, president and general manager, J. L. Osgood Machinery & Tool Co., Inc., Buffalo, will leave Nov. 15 on a business trip to the Hawaiian Islands and through South America to study future prospects for export machinery trade. He will return to the United States early in March.

JESSEL S. WHYTE, vice-president and general manager, MacWhyte Co., Kenosha, Wis., manufacturer of wire rope, cable, etc., has been appointed a member of the Wisconsin State Board of Vocational Education for the term ending July 1, 1933. EDWARD J. KEARNEY, secretary and treasurer, Kearney & Trecker Corp., Milwaukee, has been reappointed member of the board for the term ending July 1, 1935. Messrs. Kearney and Whyte are the representatives of industry on the board.

JOHN F. KELLER, Cleveland, is giving a series of six weekly lectures on steel and its treatment at the Public Service Building in Milwaukee, under the auspices of the Milwaukee section, American Society for Steel Treating, and the Engineers' Society of Milwaukee, with which the section is affiliated.

FRANK A. SCOTT, formerly chairman of the board of Warner & Swasey, Cleveland, has been appointed fiscal director of Western Reserve University.

ALBERT M. STEADFAST, for many years a sales representative of Steadfast & Roulston, Inc., Boston, has been made vice-president and a director, to succeed the late J. W. R. ROULSTON.

L. S. CUSATO, General Electric Co., has been made superintendent of division 1, Pittsfield, Mass., plant, to succeed A. M. JONES, who is to be assigned to the staff of general super-

intendent of the United States and Canada. Another Canadian office is located at Vancouver, B. C.

JOHN J. BERLISS has been elected general manager of the Roller Bearing Co. of America, Trenton, N. J. He has been treasurer for the past 12 years and still fills that position. CARL A. JOHNSON, for the past 13 years with the Hyatt Roller Bearing



B. F. Shepherd
Lehigh Valley Chapter



F. B. Drake
Golden Gate Chapter

New Directors
for 1931 of the
American Society
for Steel Treating

intendent. Mr. Cusato at the age of 14 started with the company as office boy at Schenectady. In 1908 he enrolled in the apprentice training class, from which he was graduated in 1912. In 1921 he was graduated from Union College with an electrical engineering degree. He was with the Erie plant for three years and has been at Pittsfield since 1926.

WILLIAM E. COLLEY has resigned from the marine sales department of the Westinghouse Electric & Mfg. Co., with headquarters at South Philadelphia, to become sales engineer with the Kingsbury Machine Works, Philadelphia. He had been with the Westinghouse company for 11 years, and has had a long and varied experience in marine work.

J. J. LYNCH, formerly chief estimator of the Cleveland district of the Austin Co., has been appointed manager of a new Canadian branch of the company to be known as the Ontario district. His office will be in Toronto at 1307 Canada Permanent Building, 320 Bay Street. Mr. Lynch is a graduate of the engineering school of Tufts College, Boston, and has been associated with the Austin Co. for six years. The addition of the new division will give the Austin Co. 17

Co., has been made director of sales of the Roller Bearing Co. of America.

HOWARD P. ZELLER, vice-president and general manager of the Donner-Hanna Coke Corp., Buffalo, has tendered his resignation, effective Nov. 15, and will leave immediately on a European trip. Upon his return about Jan. 1 he will become associated with the Jamison Coal & Coke Co., Greensburg, Pa. Mr. Zeller has been identified with the Donner-Hanna company since its inception during the war period and was previously associated with the Toledo Furnace Co., Toledo, Ohio. He is active in the affairs of the Eastern States Blast Furnace and Coke Oven Association, serving at present as its vice-president.

C. B. AUDEL, manager of employees' service, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will speak on "Waste Elimination" at the regular monthly meeting of the Pittsburgh Foundrymen's Association, to be held at the Fort Pitt Hotel, Pittsburgh, on Monday evening, Nov. 17. Mr. Auel is chairman of the elimination of waste committee of the American Society of Mechanical Engineers, and has devoted much time and study to the subject.

Machine Tool Business Continues to Drift

▲ ▲ ▲
LACKS Support of General
Business Expansion—Sales
Are Few
▼ ▼ ▼

MACHINE tool markets are as dull as they were in October, and current prospects do not indicate any marked change before the new year.

There is a feeling that machine tool buying will respond quickly to the stimulus of general business expansion, because the extremely competitive price situation on most products will make it necessary for many companies to whittle down their produc-

tion costs to keep in the running. This indication is apparent even now, such interest as exists in the purchase of new equipment being preponderately in special machines that will bring unit production costs lower.

Many of the current inquiries, it is believed, are being put out for estimating and inventory purposes. Only a small part of the inquiries culminate in orders. Prospective buyers who have received quotations find it con-

venient at this time to state that they have postponed action to the new year.

The announcement by a Pittsburgh maker of steel mill equipment that orders for \$50,000,000 to \$75,000,000 worth of such equipment will be placed by the steel companies in the near future has attracted wide attention, but specific details are lacking and it is thought that the prospective business represents programs of extended duration.

New York

Conditions are not favorable for an early improvement in machine tool buying. Inquiries are in smaller volume than they were a month ago, and, with rare exceptions, companies that have been contemplating the purchase of new equipment are satisfied to postpone the closing of orders until after the first of the year. A few local sellers are doing a fair business in special tools or standard tools with special equipment, but inquiries for and sales of standard tools are extremely light. Machine tool salesmen, in canvassing their customers, find new evidences of improving business in general industrial lines.

Chicago

Except for the revival of several important old inquiries at Milwaukee, the local machine tool market offers little of real interest. Dealers, in looking for a true measure of business, are turning back to 1921 for comparison. Orders taken in July, August and September of this year were about equal in volume to those of the corresponding months in 1921. October this year is appraised differently by various dealers. For many it was near the low point of the year, while several dealers report sales in that month from 5 to 15 per cent ahead of the average for July, August and September.

Farm equipment manufacturers are occasionally inquiring for a single tool in anticipation of starting winter production schedules. Job shops are hungry for work and are little interested in new equipment. On the whole, users are buying more closely and the cheaper tools are attractive to many.

Cincinnati

Except for a few scattered orders, machine tool demand is negligible.

Single tool bookings the past week, however, were enough to keep plants in operation at the present rate of production. Requests for quotations continue, but so far buyers have not acted upon prices already received. No improvement is anticipated in demand before the middle of the first quarter.

Milwaukee

Lacking support of any general improvement in business, the machine tool market continues to drift. Occasional orders are being booked, and in most cases these are sufficient to maintain production schedules at the average rate of recent months. Few new plant extensions are being projected in this locality, and it is believed unlikely that there will be much improvement in this respect before the turn of the year. The situation is not wholly discouraging, however, for inquiry is slightly more active than in October and a fair volume of business is being done in replacement business growing out of plant modernization some of the larger users of tools have undertaken to prepare for the upturn in business which, it is felt, cannot be far off.

Cleveland

Recent slight improvement in inquiry has not resulted in any gain in machine tool business, which is fully as low as in October. Trade is centering its efforts on attempts to interest machinery users in replacing some equipment with modern tools that will tend to reduce production costs. Some tool and die shops are figuring on new machinery because they find that with the present extremely competitive situation more efficient equipment must be installed to meet prices quoted by shops having lower production costs. Considerable machine tool equipment will be required for the manual train-

ing department of the John Marshall High School, Cleveland, erection of which will start shortly. No business is coming from the railroads. Some local machine tool manufacturers have further curtailed operations.

Pittsburgh

Machine tool business continues dull, but dealers are hopeful of improvement after the first of the year and are seeking to develop prospective orders for that time. Sales are confined principally to single tools, and even business of this sort is restricted.

Some new inquiry is coming out, but the more important items are being brought out for budget and estimating purposes with no idea of early purchases. According to the head of a large maker of rolling mill equipment in this district, the larger steel companies plan the expenditure of \$50,000,000 to \$75,000,000 for new mill equipment in the near future, but specific details are lacking and a considerable part of such expenditures is thought to represent programs of extended duration. The Jones & Laughlin Steel Corp. is reported to be in the market for a strip mill for its Aliquippa works, and the Great Lakes Steel Corp., Detroit, has not yet placed a 10-in. bar mill authorized a short time ago. Otherwise little inquiry for heavy equipment is before the trade. The Westinghouse Electric & Mfg. Co., East Pittsburgh, has a few inquiries for new tools before the trade, but has not issued an extensive list for 1931. Despite car building activity by the railroads, they are accounting for little tool or equipment inquiry.

New England

Some fairly large new tools were sold the past week, but the market in general remains deadlocked, with buy-

ers and sellers apparently no nearer getting together than they were two months ago. Buyers, however, continue to show interest in equipment, partly for inventory purposes, but mainly for 1931 production schedules. They say that business will have to be much better before directors will allow the purchase of machine tools.

Small tool sales in October were slightly better than those in September and also better than those in the same period last year.

New York

PLANS are under way by General Bronze Corp., Tenth Street, Long Island City, for new plant near that place for centralization of three present Eastern works, including those at Long Island City and Corona, L. I. Additional machinery will be installed for manufacture of new lines of products, entire project to cost over \$250,000. Headquarters are in Grant Building, Pittsburgh.

Crane Co., 836 South Michigan Avenue, Chicago, is asking bids on general contract until Nov. 17 for three-story and basement factory branch, storage and distributing plant, 170 x 175 ft., with pipe and mechanical shop, at Long Island City, to cost over \$250,000 with equipment. Voorhees, Gmelin & Walker, 101 Park Avenue, New York, are architects.

S. L. Snyder Co., 333 West Fifty-second Street, New York, plumbing and heating equipment, has leased eight-story building, 50 x 100 ft., at 432-34 West Forty-fifth Street, and will occupy part of structure for new branch plant. Samuel L. Snyder is president.

Prest-O-Lite Co., Inc., 30 East Forty-second Street, New York, manufacturer of acetylene apparatus, welding equipment, etc., a subsidiary of Union Carbide & Carbon Corp., same address, has acquired tract of 7 acres in Clearing Industrial District, Chicago, as site for new plant, to cost over \$100,000 with equipment. Work will begin early in spring. Company engineering department is in charge.

Thomas E. Larkin, 239 Hoosick Street, Troy, N. Y., and Archibald B. Wheeler, Colonie, N. Y., have organized Wheeler-Larkin Corp., to operate a plant at Troy for manufacture of refrigerating equipment. Edgar T. Wheeler, 319 Washington Avenue, Albany, N. Y., is interested in new company.

Following recent acquisition of National Electric Products Corp., 233 Broadway, New York, manufacturer of cables, wires, tubing, etc., by Phelps Dodge Corp., 40 Wall Street, operating copper properties, plans are under way for expansion in output of first-noted company to develop production of finished products closer to mine capacity. National company has plants at Ambridge, Pa., Elizabeth and Bayonne, N. J.

Long Island Ice Corp., Huntington, L. I., care of C. Leslie Weir, 13 East Thirty-seventh Street, New York, architect and engineer, will erect one-story plant, 30 x 150 ft., to cost over \$65,000 with machinery.

Jersey Central Power & Light Co., Asbury Park, N. J., has secured permission to dispose of preferred stock aggregating \$700,000 and common stock in like amount, to be used in part for extensions and improvements in plants and system.

Pathe Exchange, Inc., Bound Brook, N. J., has plans for a one-story factory unit, 40 x 180 ft., at local motion picture

film plant, to cost over \$65,000 with equipment. J. N. Pierson & Son, 198 Jefferson Street, Perth Amboy, N. J., are architects.

Robert C. Bossert, 208 First Street, Newark, contracting and excavating, has purchased one-half acre on Delavan Avenue, and plans erection of equipment storage and distributing plant, with repair, service and garage building for motor trucks and cars.

Seawood Corp., 16 West Sixty-first Street, New York, manufacturer of yachts and other seacraft, has purchased waterfront property at South River, N. J., for new plant. An existing building will be remodeled and other structures erected to cost over \$40,000.

Union Carbide & Chemical Co., 30 East Forty-second Street, New York, subsidiary of Union Carbide & Carbon Corp., has awarded general contract to Curtis & Mink, 11 Park Place, New York, for one-story plant at Hillside, N. J., for production of special industrial gases, etc., to cost close to \$50,000.

New England

PLANS are under way for a new one-story foundry at plant of Eastern Malleable Iron Co., New Britain, Conn., for which bids will be asked on general contract soon after first of year, to cost over \$40,000 with equipment. Headquarters are at Naugatuck, Conn. Max J. Unkelbach, 52 Main Street, New Britain, is architect.

Department of Streets and Highways, City Hall, Springfield, Mass., has awarded general contract to E. J. Pinney, Inc., 220 Dwight Street, for two-story and basement equipment storage, service and

INDUSTRIAL ACTIVITY

Prospects Revealed by a Survey of Construction Projects

NEW construction reported in the past week requiring machinery and other equipment reaches a total of \$121,000,000, exclusive of a \$14,250,000 bond issue by a public utility company. This compares with \$42,000,000 a week ago and \$32,000,000 two weeks ago. Of the total, hydroelectric and other power projects represent \$87,000,000, development in the oil industry almost \$26,000,000, municipal construction of electric power plants and water works more than \$3,000,000, and industrial construction close to \$5,000,000.

Included in the extensive projects for power development are the plans of the Appalachian Electric Power Co. for a hydroelectric plant on the New River in Virginia to cost about \$11,000,000, a hydroelectric plant for the Holyoke Water Power Co., Holyoke, Mass., to cost \$500,000 and a hydroelectric development at Rock Island, Wash., by the Puget Sound Power & Light Co. to cost \$25,000,000. Improvements and extensions at Buffalo by the Niagara-Hudson Power Corp. will cost \$50,000,000.

Of about \$26,000,000 to be expended by the oil industry, \$25,000,000 is in a storage and dis-

tribution terminal at Des Moines, Iowa, to be built by the Phillips Petroleum Co. An addition to the refinery of the Associated Oil Co., San Francisco, will cost \$200,000.

Industrial construction of \$5,000,000 includes about \$1,000,000 in the metal-working field for plants in North Carolina, New York, Connecticut, Illinois, Michigan, Ohio, Indiana, Louisiana, Oklahoma and Nebraska. Among the larger projects are storage and distribution plants for the Keystone Steel & Wire Co., Peoria, Ill., and the International Harvester Co. at Lincoln, Neb.

Other large industrial projects include a \$1,500,000 floating drydock at Tampa, Fla., a \$500,000 mechanical laundry in Chicago for the Pullman Co. and a \$250,000 freight terminal at Fort Worth, Tex.

Vocational school construction of about \$3,000,000 includes training shop equipment at the Indiana State Sanatorium, Rockville, Ind., and schools in Baltimore, Ishpeming, Mich., Mercedes, Tex., Oklahoma City, Okla., and Middletown, Conn.

repair works, to cost more than \$100,000 with equipment. McClintock & Craig, 458 Bridge Street, are architects.

Public Service Co. of New Hampshire, Manchester, has secured permission to purchase hydroelectric generating plant and power dam of Boston & Maine Railroad at Eastman Falls, Franklin, N. H., for \$600,000, and will consolidate with its properties. Purchasing company is considering expansion to double present capacity.

Roxbury Iron & Metal Co., Inc., Boston, has been organized to take over and expand company of same name with plant at 140 Granite Avenue, Roxbury. Marks Angel is president and treasurer of new company.

Peerless Cement Co., Holbrook, Mass., has acquired part of plant of American Rubber Co., Stoughton, Mass., and will remodel for manufacture of rubber cement, waxes and kindred products. Plant will be ready for service early next year.

Lynn Gas & Electric Co., Lynn, Mass., has applied for permission to increase capital to \$585,000, part of fund to be used for extensions and improvements in plants and system.

L. R. Spencer, 1331 Farmington Avenue, West Hartford, Conn., and associates have organized Spencer Aircraft Motors, Inc., Hartford, with capital of \$100,000, and will operate local plant for manufacture of aircraft engines and parts. W. A. Countryman, Jr., 92 Fern Street, Hartford, is interested in new company.

A special meeting of stockholders of American Bosch Magneto Corp., Springfield, Mass., has been called for Nov. 18, to ratify merger with Robert Bosch Magneto Co. New company will be known as United American Bosch Corp., elimination of word "magneto" being in line with broadening activities of the company, which now embrace many lines. Officers of United American Bosch Corp. will be Arthur T. Murray, president; Morris Metcalf, vice-president and treasurer; Louis Bech, G. J. Lang, Leon W. Rosenthal, Hermann Waker, J. E. Wild, vice-presidents; R. W. Washburn, secretary and assistant treasurer.

Board of Education, Middletown, Conn., will soon award contract for a junior and senior high school to contain mechanical shops, to cost \$260,000 with equipment.

Sayles Finishing Plants, Inc., Lincoln, R. I., has awarded contract for two, three and four-story textile printing plant, to cost \$300,000 with equipment. Considerable electrical equipment will be purchased.

Holyoke Water Power Co., Holyoke, Mass., has plans for a hydroelectric plant to cost about \$500,000 with equipment. A crane will be required.

Milwaukee

BUSINESS of Stoll Mfg. Co., 2126 South Avenue, La Crosse, Wis., manufacturer of tools, dies, jigs, automotive stampings and hardware specialties, has been incorporated as Stoll Mfg. Co., Inc., with capital stock of 600 shares of \$100 par value. Matthew H. Stoll, founder and manager, died Sept. 12 and incorporation is to admit new managing interest. Principals are Mrs. Agnes Stoll, Albert Arenz and George J. Schelbe.

Milwaukee foundry of General Bronze Corp. has taken order for 675 combination bronze and steel window sash units for addition to building of Northwestern Mutual Life Insurance Co., Milwaukee, and is increasing working force from 75

to nearly 200 to handle this and other orders. Most of steel work on sash order will be done in General Bronze branch plants at Minneapolis and Chicago.

Electors of Grafton, Wis., have approved bond issues to build municipal waterworks system to cost \$45,000 and sewer system and disposal plant costing \$55,000. Plans are being prepared by Paul L. Clark, consulting engineer, Appleton, Wis. Richard Goldberg is village president.

Kerner Incinerator Co., Milwaukee, has transferred operation to its new plant at 3707 North Richards Street, where 100 per cent increase in area is available. Company manufactures gas-fired and flue-fed garbage reduction units and recently acquired Kleenburn Incinerator Co., Milwaukee; Morse-Bulgar Co., New York, and Kernit Incinerator Co., Amperre, N. J. Mackey Wells is president.

Department of Public Works, Sheboygan, Wis., has placed contracts for a \$20,000 addition to municipal machine shop and warehouse and will soon be in market for several tools and one hand-operated crane. Erwin Mohr is city clerk.

City Water Department, Stevens Point, Wis., has engaged Frank Spalenka, local architect, to design new municipal shop, storage and office building, 40 x 70 ft., two stories and part basement, to cost \$25,000 with equipment. C. E. Van Hecke is superintendent.

Buffalo

WORK is being completed on addition to plant of Simonds Saw & Steel Co., Lockport, N. Y., to cost about \$500,000 with equipment, for manufacture of stainless steel products. Headquarters are at Fitchburg, Mass.

Colonial Radio Corp., 634 Lexington Avenue, Rochester, N. Y., manufacturer of radio equipment and parts, has acquired plant and business of King Mfg. Corp., 254 Rano Street, Buffalo, manufacturer of kindred equipment, including cream separators, and will consolidate. Buffalo plant has floor area of 278,000 sq. ft., and will be continued as branch works. W. S. Symington is president of Colonial organization. Elmer E. Eckler, heretofore vice-president and treasurer of King company, will continue in charge of production at Buffalo plant.

Starl Nottingham, Cuba, N. Y., and associates have organized Nottingham Mfg. Co., to manufacture alarm switches and kindred products. Allen Canfield, Cuba, is interested in new company.

International Business Machines Corp., Binghamton, N. Y., is planning removal of branch plant at Dayton, Ohio, devoted to manufacture of heavy duty scales, parts, etc., to main works at Binghamton early next year. Work is under way on addition to last-noted plant to accommodate scale division, as well as for enlarged output of calculating and other office equipment. New unit will cost over \$100,000 with equipment.

Niagara-Hudson Power Corp., Buffalo, operating Buffalo General Electric Co., Niagara Falls Power Co., Niagara Falls, N. Y., has authorized expansion and improvements in various power plants and systems to cost about \$50,000,000. Company has acquired Baldwinsville Light & Heat Co., Baldwinsville, N. Y., and will consolidate, expanding facilities in that district.

J. H. Williams & Co., Buffalo, manufacturers of drop forgings and drop-forged tools, have closed contracts for an addi-

tion to local plant which will increase floor space about 30,000 sq. ft. Extension will be used for additional heat-treating facilities, finishing, assembling and storing. New line of detachable socket wrenches is partly responsible for plant enlargement.

Pittsburgh

CONTRACT has been let by Electro Metallurgical Co., 30 East Forty-second Street, New York, a subsidiary of Union Carbide & Carbon Corp., same address, to Rust Engineering Co., Pittsburgh, for additions to plant at Boncar, W. Va., including new all-steel furnace building, locomotive house, motor station, storage and distributing plant and other units, to cost over \$500,000 with equipment.

A. A. Albaugh, Warren, Pa., and associates have organized Erie Unit Parts Co., Erie, Pa., with capital of \$20,000, and plan operation of factory at Erie for production of parts for automobiles and airplanes. George L. Craft and Earl V. MacDonald, both of Warren, are interested in new company.

City Council, Moundsville, W. Va., is considering installation of municipal electric light and power plant, and will arrange bond issue soon. J. J. Sammons is city engineer.

Dravo Contracting Co., Neville Island, Pittsburgh, has work nearing completion on addition to boat-building and marine repair plant, and will install electrically-operated machinery and other equipment.

Westinghouse Electric & Mfg. Co., East Pittsburgh, has plans for a one-story addition to branch plant at Emeryville, Cal., to cost close to \$40,000 with equipment.

Emlenton Refining Co., Emlenton, Pa., has approved plans for a new unit at gasoline oil refinery, to cost about \$250,000 with equipment. Work will be carried out under direction of Universal Oil Products Co., 310 South Michigan Avenue, Chicago.

Detroit

BIDS will be received by Board of Water Commissioners, 735 Randolph Street, Detroit, until Nov. 25 for three overhead electric traveling cranes for power plant at Springwells Station, one unit of 80,000-lb. capacity, 63 ft. 5 in. span; second unit, 20,000-lb. capacity, 18 ft. 10½ in. span, and third unit 10,000-lb. capacity, 39 ft. 3 in. span. George H. Fenkell is general manager and chief engineer.

Sparks-Withington Co., Jackson, Mich., manufacturer of radio equipment, automotive products, etc., is planning an addition to factory unit at Michigan and Horton Avenues, including improvements in present structure, to cost over \$45,000. It is understood that company will remove plant of Autorad Electric Corp., Adrian, manufacturer of kindred products, recently acquired, to Jackson and increase capacity.

Commonwealth Southern Corp., Lansing, Mich., has plans for a two-story automobile service, repair and garage building, to cost about \$100,000 with equipment. Allied Engineers, Inc., Jackson, is architect and engineer.

Metal Process Corp., Detroit, has awarded general contract to Hoffman Construction Co., 6455 Kingsley Street, for new plant in Fordson district, to cost about \$70,000 with equipment.

Valvoline Oil Co., 1761 Elmore Street, Cincinnati, has plans for a new two-story bulk oil storage and distributing plant at Detroit, to cost over \$65,000 with equipment. Stophlet & Stophlet, Security Bank Building, Toledo, Ohio, are architects.

Port Huron Thresher Co., Port Huron, recently organized with capital of \$50,000, will take over a building at former plant of Port Huron Engine & Thresher Co., for storage and distribution of threshing machines and other farm equipment, with service and repair department. E. L. Wilson, formerly connected with Port Huron Engine & Thresher Co., is president; William McCreight, 3119 Peavey Street, is vice-president.

Youngstown Sheet & Tube Co., Ironwood, Mich., has approved plans for a new power house at its Newport iron ore mining properties, to cost about \$65,000 with equipment. Headquarters are at Youngstown, Ohio.

Board of Education, Ishpeming, Mich., is contemplating installation of manual training equipment in connection with rebuilding local high school, recently damaged by fire, to cost \$175,000, for which plans have been approved. Warren S. Holmes Co., Lansing, is architect; N. Albert Nelson, Ironwood, is associate architect.

Board of Public Works, Lansing, Mich., has work under way on expansion and improvements at municipal electric light and power plant at Moores Park, to include installation of equipment, to cost close to \$1,750,000. Otto Eckert is superintendent of municipal light and water department.

South Atlantic

BIDS have been asked by Caroline Foundry Co., 723 South Caroline Street, Baltimore, manufacturer of semi-steel and gray iron castings, for three-story addition, to cost over \$45,000 with equipment. W. S. Austin, Maryland Trust Building, is consulting engineer.

North American Cement Co., Security, Md., plans rebuilding part of plant, including cleaning and storage and distributing units, recently destroyed by fire, with loss over \$50,000, including equipment.

W. F. Colvert & Sons, Marion, Va., building materials, is planning new local asphalt plant for pre-mix service, including drying and screening plant for raw materials, mixing tower unit, weighing and batcher plant, and boiler station, to cost over \$70,000 with equipment. A similar plant is proposed at Lynchburg, Va.

Appalachian Electric Power Co., Bluefield, W. Va., is arranging early construction of power dam for hydroelectric generating plant on New River, Pulaski County, Va., for which permission has been asked. Project will include transmission system for connection with present lines and will cost close to \$11,000,000.

Public Improvement Commission, City Hall, Baltimore, is contemplating installation of manual training equipment in new high school for colored students to cost about \$450,000, for which bids are being asked on general contract until Nov. 19. Taylor & Fisher, Baltimore Trust Building, are architects; Henry Adams, Calvert Building, is mechanical engineer.

Bureau of Yards and Docks, Navy Department, Washington, will take bids at once for conveyors and cableway systems, cranes and hoists, boiler plant equipment,

ventilating apparatus, etc., for naval ammunition depot at Hawthorne, Nev.; also for air compressors for navy yard at Boston; two 1000-hp. horizontal water-tube boilers, stoker-fired furnaces, motor-driven forced-draft equipment, steam-jet ash conveyor, and accessory equipment for Washington navy yard, and a 10-kw. exciter unit, switchboard, cables, conduits, etc., for marine barracks, Parris Island, S. C.

Catawba Ice & Fuel Co., Spencer, N. C., operated by Southeastern Ice Utilities Co., Portsmouth, Va., plans rebuilding part of ice plant recently destroyed by fire, with loss over \$75,000 including equipment.

Commonwealth Marble & Granite Co., Candler Building, Atlanta, Ga., has asked bids on general contract for rebuilding part of mills recently destroyed by fire, with loss of more than \$125,000 including equipment. Company is affiliated with National Marble & Granite Co., same address.

Service Ice & Storage Co., Albany Avenue, Waycross, Ga., is planning extensions and improvements in ice-manufacturing plant, including installation of additional equipment.

Sykes Foundry Co., Maple Avenue, Burlington, N. C., is planning to rebuild part of machine shop recently destroyed by fire, with loss of about \$25,000 including equipment.

Crewe Tool Works, Crewe, Va., care of Sherlock Bronson, Crewe, recently organized by Mr. Bronson and associates, plans operation of local machine works for manufacture of tools, machine parts, etc.

Imperial Fossil Marble Corp., Panther Gap, near Goshen, Va., recently organized, is planning installation of new marble-working plant at local properties, including one-story cutting, grinding and finishing mill; conveying loading and other equipment, to cost over \$65,000.

City Council, Elberton, Ga., is considering construction of a municipal hydroelectric power plant and system, for which plans will be drawn soon.

Chicago

PLANS are under way by Clements Mfg. Co., 609 Fulton Street, Chicago, manufacturer of vacuum cleaners, industrial cleaning equipment, etc., for a new one-story plant in Clearing Industrial District, totaling about 21,000 sq. ft. floor space, to cost close to \$50,000 with equipment. Present factory will be removed to new location.

Strong & Hanson, Belvidere, Ill., are planning erection of one-story marble-working plant, including cutting, grinding, polishing and other departments, to cost over \$40,000 with equipment.

North Dakota Power & Light Co., Bismarck, N. D., is planning an addition to power plant at Mott, N. D., including installation of Diesel engine unit and other equipment, to cost over \$45,000.

Keystone Steel & Wire Co., Industrial Street, Peoria, Ill., has plans for a one-story addition, 300 x 400 ft., for storage and distribution, to cost about \$100,000 with equipment. H. C. Hewell is company engineer.

Phillips Petroleum Co., Bartlesville, Okla., is considering gasoline storage and distributing terminal at Des Moines, Iowa, in connection with new pipe line now under way to that city, Omaha, and Minneapolis. Terminal unit will cost over \$250,000 with equipment.

Pullman Co., Adams Street and Michigan Avenue, Chicago, has awarded general contract to Van Etten Brothers, 11016 South Michigan Avenue, for a three-story mechanical laundry, 87 x 274 ft., to cost about \$500,000 with steam power, conveying and other equipment. Weiss & Niestadt, 53 West Jackson Boulevard, are architects.

City Council, Vermillion, S. D., is considering extensions and improvements in municipal electric light and power plant, including installation of additional machinery. M. W. Davidson, professor of mechanical engineering, South Dakota State University, Vermillion, is engineer.

Northwestern Bell Telephone Co., 318 South Second Street, Cedar Rapids, Iowa, has leased one-story and basement building, 60 x 90 ft., to be erected at 703 B Avenue, N. W., for a new repair and service shop.

Commonwealth Edison Co., 72 West Adams Street, Chicago, has secured permission to dispose of a new issue of common stock to total \$14,250,000, part of fund to be used for extensions and improvements in power plants and system.

Noonan-Malmstrom Co., 1845 Carroll Avenue, Chicago, machinist, has purchased plant of Monighan Foundry Co., 2135 Carroll Avenue and will operate as Monighan division of Noonan-Malmstrom Co.

W. G. Weiss has taken over former company, Scott-Weiss Steel Co., Chicago, and has organized Midland Steel & Equipment Co., 400 South Clinton Street, Chicago, to do a general iron, steel and machinery business.

Cincinnati

PLANS are under way by Hauser-Stander Tank Co., Spring Grove Avenue, Cincinnati, for one-story addition, totaling about 70,000 sq. ft. floor space, to be equipped primarily as a pickling unit, reported to cost over \$125,000 with machinery. Lockwood, Greene Engineers, Inc., Hanna Building, Cleveland, is architect and engineer.

John J. Brown, Provident Bank Building, Cincinnati, architect, has plans for a multi-story automobile service, repair and garage building, to cost about \$140,000 with equipment.

Board of Trustees, Ohio Soldiers and Sailors Orphans' Home, Xenia, Ohio, has authorized a fund of \$16,000 for purchase of tools and equipment for new vocational school at institution, including machine shop, sheet metal-working and wood-working shops. State architect, Columbus, Ohio, is in charge of project.

United Pipe Line Co., Signal Mountain Building, Chattanooga, Tenn., is planning construction of natural gas pipe line from gas properties to Fayetteville, Tenn., and vicinity, to cost over \$85,000. Company is affiliated with United Light & Power Co., 105 West Adams Street, Chicago.

National Biscuit Co., 715 Chamberlain Avenue, Knoxville, Tenn., has awarded general contract to V. L. Nicholson Co., 102 West Clinch Avenue, for one-story storage and distributing plant, 55 x 125 ft., to cost about \$50,000 with equipment. Headquarters are at 447 West Fourteenth Street, New York.

Board of Education, Louisville, is considering an addition to Ahrens Trade School to cost close to \$300,000 with equipment. J. Meyrick Colley is architect for board.

Truscon Steel Co., Dixie Terminal Building, Cincinnati, with main plant at

Youngstown, Ohio, has filed plans for a one-story factory branch, storage and distributing plant, 80 x 150 ft., to cost close to \$40,000 with equipment.

Columbia Gas & Electric Co., 61 Broadway, New York, operating Cincinnati Gas & Electric Co., Cincinnati, and other electric light, power and gas properties, has secured controlling interest in American Fuel & Power Co., operating Inland Gas Co. and Kentucky Gas Corp., with natural gas properties in eastern Kentucky, and will consolidate with other holdings in that section. By this acquisition company also secures right-of-way for natural gas pipe line for service at Detroit and vicinity, and plans development program for this and other expansion.

E. H. Bards Range & Foundry Co., 2619 Colerain Avenue, Cincinnati, has taken bids on general contract for one-story foundry addition, 52 x 105 ft., to cost close to \$50,000 with equipment. Kruckemeyer & Strong, St. Paul Building, are architects.

Ohio River Motor Boat Co., foot of York Street, Newport, Ky., is planning new boat and yacht plant near Coney Island race track on Ohio River, near Cincinnati, to cost over \$150,000 with equipment. Drydock and repair facilities will be provided.

St. Louis

PLANS have been completed by Standard Oil Co., 500 North Grand Street, Springfield, Mo., for two-story storage and distributing plant, to cost about \$70,000 with equipment. Schlitz & Bailey, 53 West Jackson Boulevard, Chicago, are engineers.

Circle Packing Co., 319 Winstanley Avenue, East St. Louis, Ill., has awarded general contract to Fred Schmitt Contracting Co., 650 Rosedale Avenue, St. Louis, for two-story addition to meat-packing plant, 50 x 100 ft., to cost close to \$45,000 with equipment. Bonnell-Tohtz Co., 1519 North Grand Boulevard, St. Louis, is architect.

Mallinckrodt Chemical Works, 3600 North Second Street, St. Louis, has purchased a factory at Toronto, Ont., for establishment of branch plant to be operated by Mallinckrodt Chemical Works of Canada, Ltd., a subsidiary.

Board of Public Utilities, Kansas City, Kan., has plans for extensions and improvements in municipal waterworks, including two-story and basement addition, 95 x 125 ft., to Quindaro water plant, with installation of pumping, power and other machinery, to cost about \$1,000,000. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is engineer.

Nicholson Clock Co., 3109-15 West Fifth Street, Tulsa, Okla., manufacturer of clocks and clock mechanisms, has awarded general contract to J. R. Forner Construction Co., Ritz Building, for one-story plant, 40 x 95 ft., to cost about \$30,000 with equipment.

Anheuser-Busch, Inc., 721 Pestlozzi Street, St. Louis, manufacturer of beverages, etc., plans rebuilding storage and distributing plant recently destroyed by fire, with loss over \$200,000 including equipment and stock.

Wright Motor Co., 400 Center Street, Little Rock, Ark., has plans for a two-story service, repair and garage building, to cost about \$100,000 with equipment. Petter & McAninch, Inc., Pyramid Life Building, are architects.

International Harvester Co., 606 South Michigan Avenue, Chicago, has taken bids on general contract for a one-story factory branch, storage, service and distributing plant, 110 x 450 ft., for motor truck division, at Lincoln, Neb., to cost over \$125,000 with equipment. W. D. Price, Chicago headquarters, is superintendent of construction.

Board of Education, Oklahoma City, Okla., plans installation of manual training equipment in two-story and basement Stonewall Jackson junior high school, for which general contract has been awarded to Charles M. Dunning Construction Co., 420 North Hudson Street, to cost over \$200,000. Hawk & Parr, First National Bank Building, are architects.

Nicholas-Beazley Airplane Co., Inc., Marshall, Mo., is in market for equipment for manufacture of upset head cap screws made from 2330 nickel steel, and also for manufacture of upset head clevis pins from No. 2330 nickel steel. Company desires to manufacture in diameters from 3/16 in. up to 1/2 in. inclusive and in lengths from 1/2 in. to 5 in. Russell Nicholas is president of company.

Cleveland

ARRANGEMENTS are being made by Harris-Seybold-Potter Co., Union Trust Building, Cleveland, manufacturer of printing machinery and parts, for concentration of production at Cleveland and Dayton, Ohio, plants. Factory at Derby, Conn., will be closed soon and machinery distributed to two Ohio plants, where expansion will be carried out to accommodate increase.

Powerlite Switchboard Co., 4149 East Seventy-ninth Street, Cleveland, manufacturer of electric switchboards and equipment, has asked bids on general contract for one and two-story addition, 50 x 125 ft., to cost about \$65,000 with equipment. H. K. Ferguson Co., Hanna Building, is architect and engineer.

City Council, Conneaut, Ohio, has authorized plans and specifications for extensions and improvements in municipal waterworks to cost about \$75,000, including installation of power equipment and other machinery.

Bowdill Co., Bowdill, Ohio, manufacturer of mining machinery and parts, is planning one-story addition, 25 x 200 ft., to cost over \$50,000 with equipment.

Garrod-Moon Corp., East Palestine, Ohio, manufacturer of furniture, has acquired two-story factory in western part of city for expansion.

Miller-Sheahan Machinery Co., Toledo, Ohio, care of Joseph O. Eppstein, Ohio Building, attorney, recently organized plans for operation of local factory for manufacture of machinery and parts. A. F. Miller and R. J. Sheahan are heads.

Morris Siegel, 1942 Woodward Avenue, Cleveland, has plans for a one-story building, 47 x 105 ft., for manufacture of reflectors and kindred products, to cost about \$45,000 with equipment.

Indiana

CONTRACT has been let by Hopkins Fertilizer Co., New Albany, to Earle Embry for one-story plant, 150 x 180 ft., to replace unit recently destroyed by fire, to cost more than \$60,000 with equipment. Raymond Ellis is president.

Board of Trustees, Indiana State Sanatorium, Rockville, is planning ex-

pansion at institution, including new mechanical shop for light arts and crafts, power plant, mechanical laundry and other structures. A fund of over \$1,500,000 is being arranged. McGuire & Shook, 941 North Meridian Street, Indianapolis, are architects; C. N. Mueller, Indianapolis, is State consulting engineer in charge.

Crouch & Foster Hardware Co., Fort Wayne, is planning to rebuild part of storage and distributing plant recently destroyed by fire, with loss about \$40,000.

Overhead Door Corporation, Hartford City, manufacturer of garage doors, hangers, etc., is planning one-story addition, totaling 26,400 sq. ft. floor space, to cost over \$50,000 with equipment.

Standard Oil Co. of Indiana, Whiting, is planning to rebuild part of local oil refinery, including high pressure still and other equipment, recently destroyed by fire, with loss over \$600,000 including machinery. Headquarters are at 310 South Michigan Avenue, Chicago.

Greiner Chemical Corporation, Fort Wayne, recently organized by Fred E. and Walter L. Greiner, Fort Wayne, with capital of \$25,000 and 10,000 shares of stock, no par value, has leased three-story building at 217 Columbia Street, and will remodel for new plant for manufacture of commercial fertilizer products. Fay W. Leas, Fort Wayne, is also interested in new company.

Philadelphia

CONTRACT has been let by Nicetown Mfg. Co., 4250 Wissahickon Avenue, Philadelphia, manufacturer of iron and steel specialties, to I. L. Tousley, Philadelphia, for a one-story addition. Company operates Philadelphia Lawn Mower Co. and other interests.

Philadelphia Gas Works Co., 1401 Arch Street, Philadelphia, has asked bids on general contract for one-story machine and plate shop, 50 x 160 ft., to cost over \$55,000 with equipment. Company engineering department is in charge.

Pennsylvania Railroad Co., Philadelphia, has approved plans for a new produce terminal near old Union Station, Baltimore, including installation of cold storage and refrigerating equipment, conveying and other handling equipment, etc., entire project to cost over \$600,000 with machinery. Company engineering department is in charge.

Chester Packing & Provision Co., Chester, Pa., plans rebuilding part of meat-packing plant recently destroyed by fire, with loss estimated at \$100,000, including equipment.

Samuel Black, 5641 North Tenth Street, Philadelphia, and associates have organized Rapid Electric Mfg. Co., and plan operation of local factory for manufacture of electric food choppers and other food product equipment. Fred C. Kneisel, 2159 East Dauphin Street, is interested in new company.

Brilliant Printing Ink Co., 241 North Juniper Street, Philadelphia, has leased three-story factory at 250 North Tenth Street, for establishment of new plant.

Pennsylvania Power & Light Corp., Allentown, Pa., has applied for permission to take over and operate 23 electric light and power companies, including Edison Electric Co., Lancaster, Pa., capitalized at \$4,000,000. Different companies operate in Lancaster, Chester, Berks, Lebanon, Union, Perry, Cumberland and other

counties. Acquiring company will carry out expansion, including transmission lines between different systems.

Pitcairn Aircraft, Inc., Land Title Building, Philadelphia, with plant at Pitcairn Field, Hatboro, Pa., is planning to develop commercial production for Pitcairn-Cierva autogiro airplanes, including parts production and assembling. A subsidiary has been organized under Pitcairn-Cierva Autogiro Co., to manufacture this new type of aircraft.

Hazard Wire Rope Co., Wilkes-Barre, Pa., has plans for a new gas producer plant at its works, for operating service in different departments, reported to cost over \$75,000.

Navy Department, Washington, is planning new one-story steel building at Philadelphia navy yard, primarily for storage and distribution. Contract has been let to Belmont Iron Works, Twenty-second Street and Washington Avenue, Philadelphia, for a crane runway at Washington navy yard.

Gulf States

A NEW two-story freight and distributing terminal, 50 x 400 ft., will be built by Gulf, Colorado & Santa Fe Railway Co., Fort Worth, Tex., to cost about \$250,000, with conveying, loading, and other equipment. Company engineering department is in charge.

Tampa Shipbuilding & Engineering Co., Tampa, Fla., is considering erection of new floating drydock with construction and repair facilities to cost close to \$1,500,000. William T. Donnelly, 247 Park Avenue, New York, marine engineer, has made a survey for project. It is proposed to acquire about 50 acres on Ybor Channel for development of shipyard. Tampa Chamber of Commerce is interested in project.

Mercedes Independent School District, Mercedes, Tex., is considering installation of manual training equipment in new high school to cost \$200,000, in which amount bond issue has been sold. W. E. Simpson & Co., Milam Building, San Antonio, Tex., are architects and engineers.

Ohio Oil Co., Findlay, Ohio, is considering extensions and improvements in oil refinery of Mid-Kansas Oil & Gas Co., at Fort Worth, Tex., to cost about \$70,000 with equipment.

Chicago Bridge & Iron Works, 1305 West 105th Street, Chicago, has awarded contract to Virginia Bridge & Iron Works, Roanoke, Va., for one-story branch fabricating plant, 150 x 400 ft., Birmingham, to cost over \$60,000 with equipment.

Trans-Mississippi Utilities Corporation, Fort Worth, Tex., operating Texas Consumers Water Co., and other utilities, has organized Southwest Water Co., a subsidiary, to take over and operate water properties of Southern Union Gas Co., at Church, Tex., and vicinity, Gallup, N. M., and Kingfisher, Okla. New company plans expansion and improvements, including installation of pumping, power and other machinery.

Texas-Oklahoma Wheat Growers Association, Plainview, Tex., J. Frank Triplett, in charge, is considering erection of new grain elevator near Happy, Tex., with elevating, conveying, screening and other equipment, to cost over \$80,000.

American Community Power Co., Plainview, Tex., operating Texas Utilities Co. and other electric light and power prop-

erties, is disposing of a note issue to total \$1,800,000, part of fund to be used for extensions and improvements. Texas Utilities Co. is considering a new steam-operated electric generating plant at Tuco, Tex., to cost over \$450,000 with transmission system. Company engineering department in charge.

Dorgan-McPhillips Packing Corp., 60 St. Louis Street, Mobile, Ala., is planning erection of new two-story factory, 50 x 85 ft., at Columbia, Miss., to cost over \$35,000 with equipment. A. J. Kressley, Mobile, is engineer in charge of erection.

Tri-State Culvert Mfg. Co., Alexandria, La., manufacturer of corrugated iron culverts and kindred products, is contemplating erection of new one-story plant, to cost over \$30,000 with equipment. D. Hagan is company representative, in charge.

Pacific Coast

WORK will begin soon on addition to oil refinery of Associated Oil Co., 79 New Montgomery Street, San Francisco, at Avon, Cal., for gasoline production, to cost close to \$2,000,000 with machinery.

Southern California Telephone Co., 740 South Olive Street, Los Angeles, has plans for a one-story automobile service, repair and garage building, 150 x 156 ft., to cost about \$125,000 with equipment. Company engineering department is in charge.

Multicolor, Ltd., 7020 Romaine Street, Los Angeles, has awarded a general contract to Myers Brothers, 3407 San Fernando Road, for a one-story addition to film laboratory and manufacturing plant, 44 x 158 ft., to cost about \$85,000 with equipment. Company engineering department is in charge.

Pacific Gas & Electric Co., 245 Market Street, San Francisco, is considering new equipment storage and distributing plant at San Mateo, Cal., to cost over \$65,000 with equipment. Company engineering department is in charge. A similar plant will be erected at Redwood City, Cal., to cost about \$50,000.

Seattle Chain & Mfg. Co., 6921 East Marginal Way, Seattle, has awarded a general contract to Austin Co. of California, Inc., Russ Building, for one-story plant unit at San Francisco, 60 x 160 ft., to cost about \$65,000 with equipment.

Puget Sound Power & Light Co., Seattle, will soon begin work on hydroelectric power project at Rock Island, Columbia River, Wash., to cost about \$25,000,000. Plant will have total rating of 240,000 hp., and will include a steel tower transmission line to Everett and vicinity. Company engineering department is in charge.

Pacific Coast Elevator Co., Pampa, Wash., is planning to rebuild part of grain elevator and plant recently destroyed by fire, with loss over \$100,000 with machinery.

Philadelphia Quartz Co., Philadelphia, Cal., Los Angeles district, and will erect a branch plant for manufacture of sodium silicate, to cost \$300,000.

Canada

TOWN COUNCIL, Cornwall, Ont., contemplates purchase of new equipment for pumping station, to cost \$7,000. J. G. Harkness is clerk.

New Brunswick Electric Power Commission, 55 Canterbury Street, St. John, N. B., has awarded steel contract for erection of a steam power plant at Minto, N. B., to St. John Drydock & Shipbuilding Co.

Sangamo Electric Co. of Canada, Ltd., 183 George Street, Toronto, has awarded general contract to James A. Wickett, Ltd., 16 Saulter Street, for two-story addition, to cost \$20,000. Chapman & Oxley, 372 Bay Street, are architects.

George W. Reed & Co., Ltd., 779 St. Antoine Street, Montreal, has awarded several contracts for a factory addition, to cost \$400,000. Church, Ross Co., Ltd., 1440 St. Catharine Street West, is general contractor.

Consolidated Pipe Co., Ltd., Canranald Street, Montreal, will start work at once on a one-story addition 65 x 140 ft.

Town Council, Alexandria, Ont., is contemplating expenditure of \$20,000 for motors, pumps and other equipment for waterworks plant. S. Macdonnell is clerk.

E. Barabe, 1274 Ste. Elizabeth Street, Montreal, will erect a blacksmith shop, to cost \$20,000. Equipment will be purchased.

Falconbridge Nickel Mines, Ltd., Concourse Building, Toronto, will start work early in 1931 on an addition to converter and smelter building at Falconbridge, Ont., to cost \$50,000.

Kellogg Co. of Canada, Ltd., Dundas Street East, London, Ont., has plans by Albert Kahn, Marquette Building, Detroit, for a power plant, to cost \$150,000. Construction will be started later in year.

Arden-Vancouver Salt Co., Dominion Bank Building, Vancouver, B. C., will erect a two-story plant at False Creek to cost \$50,000. Company has secured site and will soon call for tenders.

City Council, Lethbridge, Alta., contemplates purchase of power plant machinery to cost \$10,000, contract to be let early next year. F. Steedman is clerk.

Foreign

PLANS have been authorized by Firestone Tire & Rubber Co., Akron, Ohio, for new plant near Buenos Aires, Argentina, where property has been acquired, to cost over \$500,000 with machinery. Engineering department will be in charge. Company has expansion program under way at mill in England.

Rybniker Steinkohlen - Gewerkschaft, Ruda, Germany, and Graf. v. Ballestrem'schen Ostoberschlesischen Industrieverwaltung, same place, operating artificial gas and coke properties, are planning joint construction of new chemical plant near Nikolai, Poland, for production of ammonia and sulphate of ammonia, to cost over \$400,000. Project will be carried out in connection with pipe line installations in west and central Poland for gas transmission.

Municipal Government, Recife, Brazil, is cooperating with a recently organized cooperative association of dairymen for construction and operation of new local pasteurizing and milk-bottling plant, with capacity of 20,000 liters (about 75,700 gal.) daily, with automatic bottling, capping, conveying and other equipment. Information at office of Bureau of Foreign and Domestic Commerce, Washington, reference Brazil No. 6720.

Opel A.G., Ruesselsheim, Germany, a subsidiary of General Motors Corp., Detroit, is arranging for production of refrigerating equipment in part of local automobile works, manufacturing Frigidaire ice and refrigerating units, as produced by Frigidaire Corp.

Ask for Increased Tariff

Makers of Wire Fencing and Wire Netting Say Industry Is Threatened

WASHINGTON, Nov. 11.—Extinction of the domestic woven wire fencing and wire netting industry is threatened by importations, according to contentions made on behalf of American producers at a hearing before the Tariff Commission last Wednesday when they asked that the duty of 45 per cent be increased under the flexible provision by 50 per cent, based on the American selling price. It was maintained that export markets have been cut off for the American trade by reason of foreign competition.

Counter claims were made by importing interests. Domestic producers supply 82 per cent of the market, leaving only 18 per cent to foreign manufacturers, it was declared by George E. Dix, New York, representing the Steel Union Co., New York; Steel, Inc., Los Angeles, and the Corn & Dehn Hardware Co., Seattle, Wash. Attorney Reese D. Alsop, New York, appeared for the Trefleries Leon Bekeart, Sweveghem, Belgium. A point emphasized by Mr. Alsop was that Belgian producers use American machinery to draw rods, and that, using the cost of production of this semi-finished line as the base, American makers of fencing and netting were on a parity with Belgian makers. Mr. Dix said there is no justification for an increase in the duty "on a commodity so highly protected."

The hearing was the outgrowth of a resolution introduced by Senator Bingham, Republican, of Connecticut.

The domestic companies represented at the hearing were the Keystone Steel & Wire Co., Peoria, Ill.; the New Jersey Wire Cloth Co., Trenton, N. J.; the Indiana Steel & Wire Co., Muncie, Ind.; Wickwire Brothers, Cortland, N. Y.; the California Wire Cloth Co., San Francisco; the G. F. Wright Steel & Wire Co., Worcester, Mass.; the Wickwire-Spencer Steel Co., Clinton, Mass., and the Gilbert & Bennett Mfg. Co., Groton, Conn.

Appearing before the commission for the domestic manufacturers were Attorney J. G. Lerch and Raymond J. Southwell, sales manager, the Wickwire-Spencer Steel Co.

Importations Have Increased

In explaining the case of the domestic producers, Mr. Lerch said that up to 1925 they had enjoyed all of the United States market for woven wire fencing and netting. He said that in that year importers brought in a lot of wire netting through the Pacific Coast for stucco work, but that it did not meet requirements of the building code and was dumped. In 1926, it was stated, importations totaled 100,000 bales of netting that met such requirements. In 1927, Mr. Lerch said, importations increased to 200,000

bales and in 1928 to 367,000 bales. The importations were declared to have increased so steadily that domestic producers no longer have export markets and but little business in the domestic market.

Confidential data were submitted giving prices and other information regarding importations from Germany and other countries. The chief countries of importations are Germany and Belgium. Mr. Lerch contended that a 50 per cent increase in the duty on foreign valuation would in no way equalize the difference in costs in the United States and abroad. For that reason, he said, domestic producers were asking for an increase of 50 per cent, based on the American selling price. Even this latter increase, it was maintained, would leave the duty 9 per cent below the difference in the cost of production.

Competitive conditions on the Pacific Coast were pointed out by Mr. Southwell in opening his remarks. When questioned by Mr. Dix, Mr. Southwell disagreed with the former that steel companies making netting were operating below cost of production in order to keep their men employed. Mr. Southwell mentioned Charleston, S. C., as one of several ports where, he said, incoming shipments of netting are being received at prices much below the American cost of production. In response to a suggestion by Mr. Dix that it would be possible for American makers of netting to buy their rods abroad, Mr. Southwell said that most of the domestic manufacturers make their own rods. He stated that, if they purchased foreign rods, they would be compelled to close their rod plants.

Consumption 2,000,000 Bales a Year

Consumption of wire netting in the United States was estimated at 2,000,000 bales annually by Mr. Southwell. He supported the statement of Mr. Lerch that if importations continue at their present ratio it will not be long before domestic producers will be put out of business. Answering a question by Mr. Alsop, it was stated by Mr. Southwell that the principal foreign markets for American makers had been Cuba, Australia, the Far East and South America. Inability to compete with foreign makers was said to have resulted in the loss of these markets.

The principal objection of importers to an increase in the duty is because wire fencing and netting can be imported to only a relatively small area of the United States, Mr. Dix said. This particular area, it was declared, could not be reached by domestic makers without incurring large freight rates, owing to their geographical lo-

cation. Mr. Dix read a telegram from the National Grange objecting to an increase in the duty and declaring that this organization of farmers would support opposition to an increase. Mr. Dix also contended that the duty should be based on the cost of production at the plants of foreign manufacturers, and not on the American selling price. The Department of Justice, he said, has expressed the opinion that freight and carrying charges themselves constitute a duty. Mr. Dix was asked by Chairman Fletcher as to what may be considered the principal domestic market, but Mr. Dix said he was unable to answer the question. Asked by Mr. Fletcher about reports that foreign governments paid rebates to manufacturers of wire fencing and netting, Mr. Dix said he had no knowledge of such a practice.

Briefs are to be submitted within 10 days from the date of the hearing, the commission announced.

National Founders to Meet Nov. 19-20

The National Founders' Association has announced the program for its thirty-fourth annual convention, to be held Nov. 19 and 20 at the Hotel Astor, New York. Among the speakers will be Dr. Harry Myers, Dayton, Ohio, whose subject will be, "Progress and Prosperity"; Walter Case of Case & Pomeroy, New York, who will discuss "New Problems in World Industry," and T. Yeoman Williams of the League for Industrial Rights, New York, in an exposition of "Unsound Economic Practices in Electrical Construction." Other topics will be "Money Savers for the Jobbing Foundry," by William C. Wright, consulting foundryman for National Founders' Association; "A New Use for Gray Iron," by Robert E. Moore, Flockhart Foundry Co., Newark, N. J., and "Technical Leadership in the Foundry Industry," by Richard S. McCaffery, professor of metallurgy, University of Wisconsin.

Steel Corporation's Unfilled Orders Increase

The first increase since July in the unfilled orders of the United States Steel Corp. was reported for October. The total on Oct. 31 was 3,481,763 tons, an increase of 57,425 tons over the 3,424,338 tons on Sept. 30. A year ago the total was 4,086,562 tons.

Unfilled tonnage at the end of each month for the past two years and nine months follows:

	1930	1929	1928
January	4,468,710	4,109,487	4,275,947
February	4,479,748	4,144,341	4,398,189
March	4,570,653	4,410,718	4,335,206
April	4,354,220	4,427,763	3,872,133
May	4,059,227	4,304,167	3,416,822
June	3,968,064	4,256,910	3,637,000
July	4,022,055	4,088,177	3,570,927
August	3,580,204	3,658,211	3,624,043
September	3,424,338	3,902,581	3,698,368
October	3,481,763	4,086,562	3,751,030
November	.....	4,125,345	3,673,000
December	.....	4,417,193	3,976,712

British Consider Subsidies to Industry to Reduce Unemployment Payments

(By Cable)

LONDON, ENGLAND, Nov. 10.
CONTINUED financial difficulties are reported by merchant firms, including some with old established Eastern connections, mostly in India. Guest, Keen & Nettlefolds have passed their interim dividend because of the industrial outlook at home and abroad.

The House of Commons is debating unemployment, with special emphasis on the iron and steel industry. Major Thomas (Conservative) has urged that immediate measures be taken to rescue industry, saying that charges of industrial inefficiency were refuted by the recent Government inquiry and that the depression is due to dumping.

Since rationalization is costly and protection is impossible under the present Government it is suggested that a subsidy to industry be paid from money otherwise spent in "doles" to the unemployed. Liberals are opposed to protection on the ground that raising the costs of raw materials to the shipyards may seriously injure other trades.

The Government spokesman refused subsidies or tariffs and stressed the importance of reorganization, stating that the Government and steel representatives are negotiating on a plan of regional organization.

Pig iron is quiet, but the Cleveland make is being absorbed so that stocks are not increasing. About 3000 tons of South Manchurian pig iron from Laiyang furnaces has been offered here, but the price was not competitive.

British exporters to India in financial difficulties as trade declines.

* * *

Contracts for new South African steel mill awarded to British, Americans and Germans.

* * *

Japanese seek increased pig iron duty as protection against Indian product.

* * *

Chinese purchases of bamboo steel increasing, but competition is keen.

Finished steel business is dull and mills are operating irregularly. Export demand is negligible and the shipbuilding outlook is especially gloomy.

The tin plate market is quiet, with consumers either well-stocked or withholding orders in expectation of lower prices. Small inquiries include 3000 boxes for South American packers. Conference mills are maintaining the schedule, but non-members are offering concessions.

Galvanized and black sheets are inactive. No. 24 gage galvanized sheets are quoted at £11 17s. 6d. per ton (2.61c. per lb.), c.&f. Indian port.

The Continental market is inactive. The French phosphoric pig iron branch of the O. S. P. M. and the Western European Pig Iron Entente have collapsed and French furnaces are offer-

ing foundry pig iron at £2 9s. 6d. (\$12.03) per metric ton.

The Continental Steel Cartel renewal after Jan. 1 is being discussed and French mills are urging a division of their quota into domestic and export, with a reduced penalty for excess domestic sales.

William Beardmore & Co., Ltd., has closed the Dalmeir yard as part of the National Shipbuilders' Security rationalization plan. The yard of Napier & Miller, Ltd., at Old Kilpatrick, Glasgow, has been purchased for closing and there are reports that certain Northeast Coast yards will also suspend.

H. J. Van Der Bijl, chairman of the board, South African Steel & Iron Industrial Corporation, has announced the award of contracts for the new Pretoria Iron & Steel Corp., to cost £2,300,000 (\$11,178,000). The steel furnaces and rolling mills went to Dorman, Long & Co. and "Demag," the blast furnace to Ashmore, Benson, Pease & Co., the by-product coke ovens to Woodall, Duckham, Ltd. It is expected that the first equipment will be shipped by the end of 1931 and the steel works will be in production within three years.

The German "Demag" will probably erect one steel furnace and two rolling mills while Dorman, Long & Co. will supply the steel for the buildings. The Freyn Engineering Corp. of Chicago will design the blast furnace while British works will construct the entire by-product coke plant. Dorman, Long & Co. will construct fabricated structural steel shops at Germiston,

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at \$4.8665 (par)

British Prices f.o.b. United Kingdom Ports				Billets, Thomas (nominal) £3 6s. to £3 7s. \$16.06 to \$16.30			
Ferromanganese, export.	£11 5s.	to £11 10s.	\$54.75 to \$55.95	Wire rods, low C., No. 5	5 2½	to 5 7½	24.94 to 26.15
Billets, open-hearth....	5 12½	to 6 5	27.34 to 30.41	B.W.G.	6 0		29.20
Black sheets, Japanese	12 5		59.61	Rails, light	11 5	to 12 12	54.68 to 58.32
specifications	0 17	to 0 17½	4.13 to 4.19	Black sheets, No. 31			Cents a Lb.
Tin plate, per base box..	7 15	to 8 5	1.69 to 1.79	gage, Japanese.....	3 18	to 4 0	0.85 to 0.87
Steel bars, open-hearth..	7 7¼	to 7 17¼	1.60 to 1.71	Steel bars, merchant....	3 18	to 4 0	0.85 to 0.87
Beams, open-hearth....	7 12½	to 8 12½	1.66 to 1.87	Steel bars, deformed....	3 14	to 3 15	0.81 to 0.82
Channels, open-hearth....	7 7½	to 7 17½	1.60 to 1.71	Beams, Thomas, British	5 12	to 5 14	1.24 to 1.26
Angles, open-hearth....	9 0	to 9 5	1.95 to 2.01	standard (nominal)...			
Black sheets, No. 24 gage	11 12½		2.52	Channels, Thomas, Amer-			
Galvanized sheets, No. 24				ican sections	3 14	to 3 15	0.81 to 0.82
gage				Angles, Thomas, 4-in.	3 19	to 4 0	0.86 to 0.87
				and larger, over ½-in.	4 17½	to 5 0	1.06 to 1.09
				thick	3 15	to 3 17½	0.84 to 0.85
				Angles, Thomas, 3-in....			
				Hoop and strip steel over			
				6-in. base.....	9 12½		2.09
				Wire, plain, No. 8 gage..	5 15		\$1.26 a keg
				Wire, barbed, 4-pt. No.			
				12 B.W.G.			
				Wire nails, base.....			

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to			
3.00 per cent sil., 1.00			
per cent and more			
phos.	£2 9½s.	to £2 10s.	\$12.03 to \$12.15

South Africa, replacing the Johannesburg plant of Wade & Dorman, but the existing Durban and Capetown works of the company will continue operation.

"Borsig" in Germany has booked 20 large locomotives for Egypt, the first time such an order has not gone to a British builder.

French output in September was 801,000 metric tons of pig iron and 767,000 tons of raw steel. At the end of September there were 140 furnaces in blast.

Japan May Increase Duty on Pig Iron Imports

WASHINGTON, Nov. 11.—A bill increasing the duty on pig iron imported by Japan is expected at the next session of the Diet, following recommendation for such an advance made by the Industrial Investigation Committee of Japan, says a cable from Tokio to the Department of Commerce.

The proposed increase in duty is understood to be a measure of protection to the Japanese producers against imports of pig iron from India. Most of the Indian tonnage, said to be delivered in Japan at lower than the cost of Japanese production, is steel-making grades, while the bulk of Indian pig iron shipped to the United States is of foundry grades.

Bamboo Steel Trade With China Revives

HAMBURG, GERMANY, Oct. 29.—Trade with China in bamboo steel, which has been dull for many months, has begun to show signs of revival and competition among German, American and Polish steel companies is keen. British producers have almost entirely withdrawn from this trade because of unattractive prices. Polish sellers are quoting bamboo steel at £13 10s. to £14 a ton (2.98c. to 3.09c. a lb.), c.i.f. Hong Kong, and the German quotation is about 5s. a ton higher.

United Steel Works Orders Off in Third Quarter

DÜSSELDORF, GERMANY, Oct. 28.—The third quarter report of the Vereinigte Stahlwerke A. G. shows a considerable decline in unfilled tonnage, which at the end of September was only 44.3 per cent of the total in September, 1929. Pig iron output in the third quarter was 1,020,762 metric tons, compared with 1,140,815 tons in the second quarter. Steel ingot production was 1,083,101 tons in the third quarter and 1,185,735 tons in the second. The number of employees has declined from 176,716 at the end of September, 1929, to 134,708 at the end of September, this year. Gross business of the company in the third quarter was 272,500,000 m. (\$64,855,000), of which 105,700,000 m. (\$25,156,600) was in export trade.

German Aluminum Products At Lower Prices

HAMBURG, GERMANY, Oct. 29.—Continental producers of aluminum products are expecting increased business as a result of the reduction in the price of aluminum from £95 a ton (20.97c. a lb.) to £85 a ton (18.76c. a lb.), which will enable them to meet the keen competition of Canadian sellers. Stocks of aluminum in Switzerland and Germany are large, totaling about 19,836,000 lb. at the end of September, compared with only 3,806,000 lb. a year ago. Although quotations on aluminum sheets have been considerably reduced, buyers are apparently awaiting still lower prices.

Increase of Steel Windows Sought in Germany

DÜSSELDORF, GERMANY, Oct. 28.—The Klockner interests have acquired 40 per cent of the shares in the Fenestra Crittall A. G. of this city, a subsidiary of the Crittall Mfg. Co., London. The company manufactures steel windows and the new interest is understood to be preparing an extensive campaign of advertising to increase their use in Germany. In the past, steel windows have not been recommended by German architects.

Holland May Construct Wire Rod Mill

HAMBURG, GERMANY, Oct. 29.—A commission has been appointed by the Government of the Netherlands to investigate the advisability of establishing in Holland a wire rod and bar rolling mill, as an aid to the wire and bolt making industry. Construction of the mill would be by private capital with Government aid.

Movietone of Making Seamless Tubes

Spang-Chalfant & Co. have made a motion picture of the process of making steel pipe, showing not only the lap-weld and butt-weld processes, but, and in more detail, the seamless tube process by what is known as the automatic method. This was given an initial showing in New York on Nov. 7. Instead of reproducing the sound of the mills, however, the "talkie" part consists of a clear explanation of the operation as the pictures pass across the screen and this, of course, is synchronized with the pictures.

After showing some early still views of Pittsburgh and of Etna, Pa., where the mills are located, the lap-weld and the butt-weld processes were taken up in detail, followed by the seamless process. In each of these cases not only was the mill operation shown, but also, by means of a diagram, the action of the rolls in forming the tube and in welding was clearly depicted and explained.

This same feature characterized the

showing of the later processes of the seamless tube mill, such as the passing of the partly finished tube through the sizing machine and the upsetting of the end of a pipe in making drill tubing. It was stated that not a single piece of equipment now in the seamless tube plant was there eight years ago.

Pipe Company Opens New Research Laboratory

(Concluded from page 1398)

department: A 15-in. South Bend motor-driven lathe, a No. 6 Gardner disk grinder, a 12-in. x 12-in. and a 4½-in. x 4½-in. Racine power hacksaw, a Barnes 20-in. swing stationary head drill press, and a milling machine. This laboratory is so laid out that the specimens may be machined promptly and physical results obtained with minimum delay.

Associated with this department is a chemical laboratory with the usual apparatus, including constant temperature ovens of various types, refractories and other special apparatus for making it possible to study cast iron products, pipe coatings and other materials under a wide range of temperature conditions in a brief time.

Large Scale Impact on Pipe

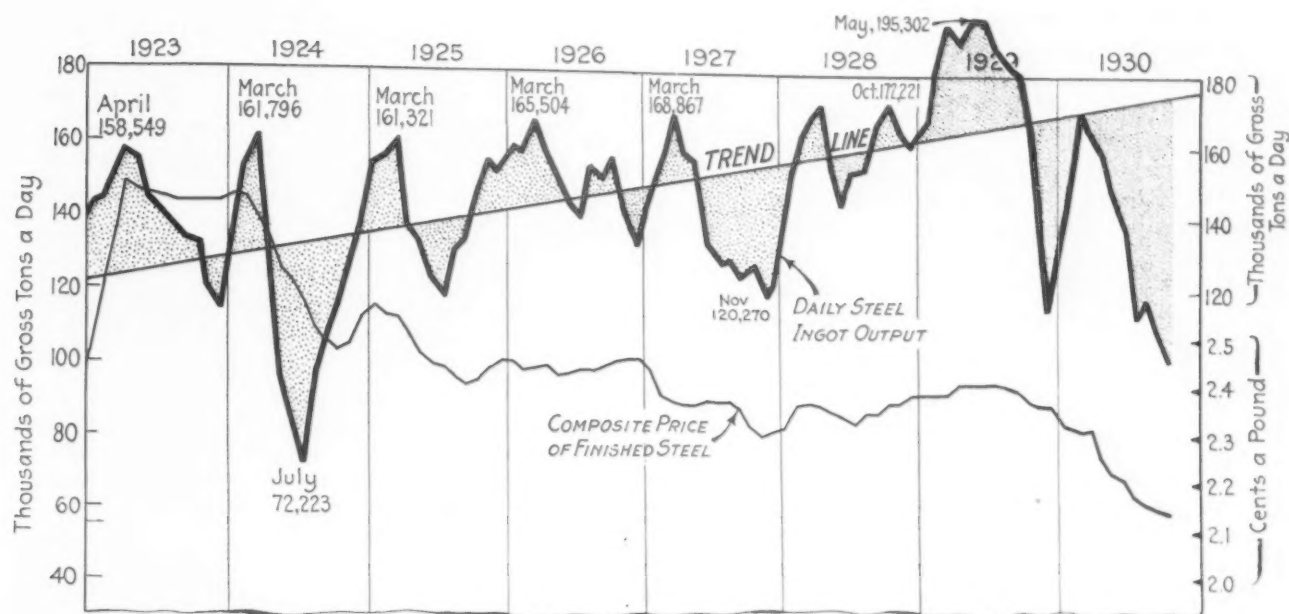
In the basement are special machines for the study of various pipe coatings, and impact machines for testing full sections of pipe. In the study of pipe coatings water samples are taken each week and the behavior of linings ascertained. By a method of agitation, employed in this special machine, it is possible to obtain in a short time data which formerly took years to develop. The permanency of cast iron and cast iron installations has always been such that decades often passed before definite results were developed. An intensive investigation has been made to shorten the period of time for obtaining results so that developments can proceed more rapidly and orderly than heretofore.

On the second floor are located the offices of the officials of the laboratory together with a library. There are also complete facilities for the projection of motion pictures in this room, which has also been arranged for use as a consulting chamber.

A special experimental unit has been provided in the main plant at Burlington where melting experiments can be conducted on special iron mixtures and on other metals. This unit is arranged so that the laboratory development along any line can be carried out in fairly sizable production without interfering with the regular operations of the plant.

Visitors on entering the building encounter an attractive lobby in which are interesting exhibits of pipe which have been unearthed after many years of service as well as sections of the different sizes of centrifugal pipe which the company produces, an interesting and informing museum display.

Ingot output in October continued the downward movement, briefly interrupted in August. Prices in October moved down about as in September, following the drop of the six preceding months



Further Drop in Ingot Production to Another New Low for Year

PRODUCTION of open-hearth and Bessemer steel ingots in the United States in October is calculated by the American Iron and Steel Institute at 2,720,414 gross tons, a drop of 5.1 per cent from the September total, following a 7.3 per cent decline in September. Thus the downward movement which has been in progress since early spring, and interrupted only by the slight spurt in August, has been definitely resumed.

Compared with a year ago we are making only 60 per cent as much steel, for October, 1929, showed a total of 4,534,326 tons.

October output represented the lowest daily average since August, 1924. It was the lowest October average since 1921. It was only 100,756 tons, compared with 167,938 tons a year earlier and with the maximum of 196,118 tons in June, 1929, in which month the institute estimates that production was at 100 per cent of capacity. While the drop of 40 per cent from October, 1929, is impressive, it must be remembered that, with one exception, that October was the highest point ever reached for the tenth month in any year.

For the first 10 months of the year production is calculated at 35,410,283 tons, the average daily rate being 136,193 tons. This represents a drop of 26 per cent from the 184,185 tons made in the average day of the first 10 months of 1929. If November

and December continue at the average October daily rate, production for the year will be about 40,500,000 tons.

Electric and crucible ingots, as for several years, are not included in the

above figures. They have not been included since 1926. Last year they represented about 1 per cent of the total ingot tonnage, and averaged some 1725 tons to the working day.

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(Gross Tons)

	Reported by Companies Which Made 94.27 Per Cent of the 1929 Ingots		Calculated Output of All Companies		No. of Working Days
	Open-Hearth	Bessemer	Monthly	Daily	
Total, 1928.....	40,538,657	6,591,217	49,865,185	160,338	311
1929					
January	3,692,062	549,616	4,500,131	166,672	27
February	3,590,826	489,279	4,328,713	180,363	24
March	4,180,408	596,691	5,068,176	194,930	26
April	4,025,409	640,351	4,950,053	190,387	26
May	4,275,161	707,484	5,286,246	195,787	27
June	3,999,363	622,004	4,902,955	196,118	25
6 months.....	23,763,229	3,605,425	29,036,274	187,331	155
July	3,922,053	649,950	4,850,583	186,561	26
August	3,987,400	668,023	4,939,086	182,929	27
September	3,624,954	642,886	4,527,887	181,115	25
October	3,631,674	642,235	4,534,326	167,939	27
10 months.....	38,929,310	6,208,519	47,888,156	184,185	260
November	2,796,214	522,672	3,521,111	135,427	26
December	2,375,797	360,489	2,903,012	116,120	25
Total, 1929.....	44,101,321	7,091,680	54,312,279	174,639	311
1930					
January	3,137,002	441,572	3,796,090	140,596	27
February	3,336,021	508,618	4,078,327	169,930	24
March	3,513,904	539,616	4,299,905	165,381	26
April	3,406,610	509,234	4,153,860	159,764	26
May	3,265,190	528,968	4,024,778	149,066	27
June	2,835,527	407,586	3,440,239	137,610	25
6 months.....	19,494,254	2,935,594	23,793,199	153,505	155
July	2,411,592	353,723	2,933,399	112,823	26
August	2,543,466	374,467	3,095,293	119,050	26
September	2,273,668	429,975	2,867,978	110,307	26
October	2,164,830	399,704	2,720,414	100,756	27
10 months.....	28,887,810	4,493,463	35,410,283	136,193	260

German Mannesmann Tests New Rust Preventives

Thorough tests have recently been carried out at the German Mannesmann Tube Works on two new rust-preventive agents called "Herolith" and "Tornesit." The former is a synthetic resin product and is applied by brushing, prior to which scale is removed by pickling. Baking and drying take about 15 min., provided the body to be protected has been preheated for about 20 min. Tubes coated with "Herolith" have successfully withstood thorough mechanical and chemical tests, the former comprising tests for resistance to shock, scratching, and conveyance by train or motor truck. Thirty-five corrosive agents were employed in the chemical tests, only three of which, hydrofluoric acid, caustic potash solution, and caustic soda solution, had any effect on the tubes. Dry heat up to 220 deg. C. and intermittent temperatures up to 300 deg. C. do not injure the coating. Steam tests, which have not yet been concluded, have so far given good results.

The other agent, "Tornesit," is a rubber product similar in appearance to cellulose. It can be brushed on the part to be protected, without preheating being necessary, and dries in 3 min. It hardens to such an extent after a few hours that even heavy hammer blows do not damage the coating. In contrast to "Herolith," "Tornesit" is resistant to alkalis, and is attacked only by hydrogen sulphide, water, benzol,

acetone, and aniline. It can be employed as a protective coating for iron, steel and other corrodible metal work.

Gas Mixtures for Multi-Fuel-Fired Furnaces

(Concluded from page 1375)

should be designed for joint burning of pulverized fuel and gases and oil for emergencies. This would solve the complete heat balance of a plant in the most complete way.

Highly Flexible in Operation

Experience accumulated so far has shown that results correspond to the expectations of the pioneers. New avenues of procedure have been opened to the fuel and efficiency engineers. Any "synthetic" gas or gas mixture can be made by the blending of two or more raw gases available. It is possible to make two gases of equal B.t.u. content, but with different ratio of carbon to hydrogen, with different flame character and with or without luminosity.

This development promises to be of real importance in cutting down fuel costs in metallurgical processes during the next few years.

Life of Cold-Heading Die Depends on Five Factors

(Continued from page 1369)

the wire is hard in one part of the circumference and soft in other parts, the first upset will be of irregular shape. The most important factor is the surface condition of the wire. A rough, seamy surface scores the die. A number of coatings have been developed by wire manufacturers which are claimed to increase die life by lessening the friction between the wire and the die. In many cases the use of these lacquer coats has improved die life, but in other cases the lacquer coat or a bright wire should be used when the die is designed to form bolts which have a sharp cornered head.

Fate of the Die Is in the Machining

In machining dies the operator holds in his hand the fate of the die, according to Mr. Jameson. The length of the life of the die depends to a great extent on his skill. It is advisable for the operator to make his set up on an old die and after it is completed to substitute a new die. If the machine set-up is wrong, a good die may be ruined after a few blanks have been made.

The investigation revealed that maximum production was obtained from dies made from steel D quenched from 125 deg. F. above the A_{3-2-1} point after holding for a period of 60 min. at heat. So far as heat treatment is concerned, quenching from a temperature of about 1625 deg. doubled the life of dies made from steels A and B as compared with a quenching temperature around 1525 deg. Steel C showed this increase to an even greater extent. Steels C and D also showed greater production by augmenting the holding time at the lower heat. The steels were not held at the higher heat for more than one hour because it was thought that the resultant de-

A FEED SCREW OF ALLOY STEEL
POURED AS A CASTING



NO little attention was attracted at the National Metal Exposition in Chicago this fall to an exhibit by the Chicago Steel Foundry Co. of a feed screw, herewith illustrated, which is a steel casting. Some detailed information concerning this unusual foundry product has now been obtained.

The casting is a 12-in. conveyor screw made of a special heat-resisting alloy steel. It is about 12 ft. long, having a 12-in. pitch with a 4½-in. shaft and with a 2½-in. cored hole the entire length. This feed screw is made in smaller sizes also for underfeed stokers for domestic heating plants.

Some of these screws are in operation at temperatures as high as 2000 deg. F. and are handling highly abrasive materials.

carburization and grain growth would nullify the benefits that might be secured.

Correct Depth of Case Important

In concluding his paper Mr. Jameson pointed out that, apart from bolt material and machine operation, the most important consideration in getting the greatest production from a die is to obtain the right case depth. He said that it is probable that this can be secured mathematically, for it varies with the force of the impact and the distribution of the stresses on the die. "Whether the right case depth is produced by varying the cooling rate, the quenching temperature, the holding time, or the chemical composition is a matter of choice." The general upward trend of production coincided with an increased case depth. Splitting of the dies proved that there was a definite relation between the case depth of the 1-in. rounds and that of the dies.

Much Depends on Type of Quenching Fixture

In the discussion of Mr. Jameson's paper, N. B. Hoffman, Colonial Steel Co., Pittsburgh, brought out the fact that, in properly hardening dies, much depends on the type of quenching fixture. To get maximum production of dies it is essential that both die ends have uniform hardness and sufficient depth to prevent sinking. Many die failures, such as spalling and chipping, are caused primarily by slight sinking due to insufficient depth hardness. In order to prevent spalling or checking of the surface core area of dies, certain manufacturers apply the following process:

Hardened dies are drawn at 410 deg. F. in oil or other drawing media, after which both faces of the die are given a secondary draw to a light straw color by immersion in molten lead to a depth of $\frac{1}{8}$ in. or by setting on a hot plate. In any event, the secondary draw should be performed as rapidly as possible, in that the depth of the draw may be shallow.

Cost and Workings of Socio-Economic Laws of Germany

(Concluded from page 1385)

Surgeons that compulsory sickness insurance seemed to produce imaginary illness and to paralyze the "will to health." The non-insured, he reported, recovered far quicker than the insured.

In the city of Wiesbaden, it was decreed that all who were receiving the dole must do public labor. As a result, 28 per cent of those getting the dole voluntarily released their claims; 22 per cent more claimed sickness but on medical examination 17 per cent were found able to work and dropped their claims. Thus, the total number of unemployed was reduced by 45 per cent.

The Socialists admit some of these abuses, but claim that such conditions always arise in the administration of huge funds. They are continually pushing for higher benefits and more liberal laws.

In the midst of these widely divergent points of view, comes now the Hitlerites or National Socialists. These Fascists apparently are a combination of the Ku-Klux-Klan, being strongly anti-Jewish and anti-

Catholic, and the Irish, who are always "agin everything." They carried on an astute political campaign in the recent election, with uniforms and bands and forceful speakers. They are the "youth" party, largely composed of the new generation that has grown up since the war. They want to restore Germany to the Germans, regain the old power and prestige, repudiate the treaties and the Young plan.

With the probable large increase in unemployment to possibly four million or more, the National Socialists will thrive on discontent and be a continual source of bother to any Central party or coalition of center groups who control the government.

Economies Result from Welded-on Overlays and Heat Treatment

(Continued from page 1371)

lays make it possible to eliminate the first division entirely and, instead of heat treating for surface hardness or a purely surface condition, a surface may be welded on which will meet the requirements much better than the heat-treated surface could.

Take, for example, a machine part, such as a cam or a lever, which, because of its contact with another machine part, must have a hardened surface to resist the wear of friction between the two. The present practice would be to carburize the part to surface hardness. Welded-on overlays may be employed and, with their employment, the part may be designed for strength and heat treated for strength and the hard surface supplied by welding on the overlay—an overlay which makes possible a surface condition unobtainable by any process of heat treatment. Present-day welded-on overlays cannot be readily machined, but they may be ground to smoothness or to the proper dimensions so that their use is almost unlimited for machine parts.

Machine Parts Can Be Redesigned with Overlays

By the use of welded-on overlays it is both possible and practical to redesign machine parts for greater strength. Furthermore, welded-on overlays could be responsible for less weight and, still more important, welded-on overlays could be responsible for greater economies in machine construction and fabrication, to say nothing of greater economies in maintenance. Once an overlay does wear through, it is easily replaced without a single change or alteration in the part overlaid.

Insofar as actual tempering or heat treating for a hardness through the piece is concerned, welded-on overlays may be employed after heat treatment, either as a protection to the surface or as a reinforcement which will result in longer useful life of the part. Oil field drilling tools are often hardened as well as overlaid and the results have been found most satisfactory. In any event, the welded-on overlay neither affects nor is it affected by the structural condition of the parts which are overlaid. The overlay produces the desired surface and, although it actually amalgamates or alloys with the parent metal to which it is applied, only the actual surface of the parent metal is in any way affected in the process.

It is interesting to note experiences in heat treat-

Business as Others See It

Digest of Current Financial and
Economic Opinion

AN upturn will be produced "when the more durable goods in possession of consumers show so much wear and tear as to convince their owners that they must replace old goods with new." That is the way *Annalist* puts it, continuing by saying that if the business man can effectively stimulate "this ultimate rising demand for new goods, on a large scale, he can hasten the recovery of business."

A more cheerful feeling in the commercial and industrial world is reported by *Commerce and Finance*. But *Business Week* lays the continuance of depression to "the weight of still unbroken financial fatalism, business inertia and popular fear."

In Favor of Maintaining Dividends

Both these publications argue that corporate dividends ought not to be cut to conform with current earnings. One mail-order house "passed its dividend, despite September sales larger than ex-

pected." The argument is that an even flow of dividends makes for stability, and that the surplus created for the "rainy day" should, if necessary, be drawn upon to provide such a flow. Cutting or passing of dividends merely adds to the panicky feeling, and should be avoided in every possible case.

That we have "lately had too much enthusiastic pessimism" is the conclusion of La Salle Extension University. "There is no evidence to indicate that America's period of growth has ended. By aggressive leadership, both in eliminating past weaknesses (overproduction, inflation and speculation, rather than analysis and research) and in initiating wiser business policies for the future, we can quickly pull ourselves out of our difficulties."

Indicators of Improving Conditions

Eleven items of "evidence that business has already made some upward progress" are listed by Alexander Hamilton Institute.

These include greater manufacturing activity, larger payrolls, increasing employment, higher index of machine tool orders, larger sales of cloth, increased residential building, heavier coal output, greater electric power sendout, expansion in foreign trade, increasing commercial loans and virtual stability in the average level of commodity prices.

That the worst is past is the verdict of Union Trust Co., Cleveland, which says, "the element of unreasonable fear and caution in business is going quite beyond the realities of the times, just as feverish speculative enthusiasm last year was beyond realities then. . . . From the long-term outlook, it seems inconceivable that American business should not maintain, in the years to come, an ever-increasing rate of prosperity."

Brookmire considers the October level "close to minimum" and predicts that "the spring of 1931 will see a cycle recovery under way."

ing machine parts that have been overlayed, that is, subjecting both the parent metal and the welded-on overlay to the same heat treatment following the overlaying process. For the most part, because of their similar analysis, the present welded-on overlays respond to the same heat treatment that has been found best for high-speed steel. That is, if the overlayed parts be subjected to temperature of from 1500 to 1550 deg. Fahr., then quenched in oil and tempered to any desired hardness of the parent metal, the overlay will be found to have acquired some hardness by the process.

Whatever results are obtained, though, will be of one character for the overlay and another for the metal overlayed. Even though the two have thoroughly amalgamated at their points of contact, under the influence of heating and quenching, the parent metal and the overlay react in accordance with their individual chemical and physical properties.

Mr. Smith outlined a series of tests showing the performance of overlays under heat treatment. In this instance the overlay is marketed under the trade name of Borod, which, after application, leaves a deposit of iron-carbon-tungsten alloy in which are intermingled fine granules of tungsten carbide. Borod consists of a soft steel sheath or outer covering with a core of fine granules of tungsten carbide and a relatively small proportion of other ingredients which act as a binder and have little or nothing to do with

the character of the deposit when the rod is welded on.

Author's Conclusions

These tests led to the following conclusions:

1.—Heat treatment does not materially change the hardness of deposited Borod.

2.—Quenching may produce cracks in electrically deposited Borod. Arc welding might be preferred where no heat treating is to be done, while acetylene welding is preferable where it is intended to heat treat. It is possible that a change of arc welding practice might adapt the arc welded material to heat treating to better advantage.

3.—The comparatively soft matrix deposited by gas welding, in which are embedded the particles of tungsten carbide, appears to resist abrasion better than the harder arc welded metal.

To be profitably used in general applications, said Mr. Smith, the overlay material must be somewhat ductile. It must be easy to apply. Experiences, so far, with tungsten and tungsten carbides, either in their nearly free state or as components of an alloy, aside from in such form as Borod, have been far from universally satisfactory as a general purpose overlay.

On the contrary, those overlays which attribute their wear-resisting properties to an alloying of metallic elements with lower melting points have proved quite satisfactory. The latter are much easier to apply and are less brittle after they are in place.



FOREWORD

ONE is apt to lose perspective in the busy whirl of daily duties. The eyes of Industry are focussed on today and tomorrow; not on yesterday.

* * *

In the swift course of progress, events flash toward us in quick succession; discoveries and inventions contribute their daily increments to the fast growing store of knowledge. Each may loom large in passing, but so swift is the pace that shortly it is part of the hazy past. The event of its coming is forgotten, though what it brings remains and multiplies.

* * *

Thus it was with the coming of steel, of electricity and the motor car. Thus it will be with the unknown wonders of the future. They become accepted and indispensable; we cannot imagine having been without them.

* * *

Thus it is that the perspective of industrial progress becomes obscure. And, because of this obscurity, men look toward the future with timidity and fear.

* * *

"May it be," they ask, "that Science, Invention and Industry have reached their prime, and must be content, henceforth, with the slower progress of maturity?"

* * *

In this 75th Anniversary Number, The Iron Age looks backward and forward with Industry. Not merely to celebrate an occasion or to record industrial history is this number shaped. Its mission is to provide the men of industry with a clear perspective of industrial progress; to fit events into a coherent pattern which will enable us to look clearly and confidently toward the future.

* * *

The past is fixed; the future we can mold.

W. W. MACON
Editor



Tapping a blast furnace of 1873, as depicted in an old engraving in Harper's Weekly. Most of the iron used in the Civil War came from such furnaces.

THE INDUSTRIAL BACKGROUND OF 1855

By JOSEPH W. ROE

Professor of Industrial Engineering
New York University

TO obtain a perspective of progress, one must be aware of the background of its beginnings. American industry, in 1855, was in its infancy. Its tools were the crude toys of an infant industry. They were insufficient to supply more than a small part of the requirements of the population. The larger part of our requirements in metals and manufactured products was imported from England. In one of the early numbers of *The Iron Age*, an editorial raised the question: "Can America ever hope to manufacture sufficient goods for its own requirements?"

Imagine industrial life in those early days. Electricity, the now indispensable servant of industry, had not been born. Steel was just emerging from the status of a rare metal. The first rail connection from the East had been made with Chicago. Long hours, muscle and man-power made up the deficit in machinery.

Professor Roe gives us a picture of industry in the 1850's, in the following article. Let us keep this picture in mind as a background against which to measure our progress since that time.



SIGNIFICANT dates are not labelled, and their importance is not recognized until long after. The year 1855

marked the rise of factors in American industry sure to overthrow slavery and challenge the predominance of agriculture in the United States. Among these were the steady growth of the steel industry and its shift west to the Alleghanies, the rise of American tool building and the proved success of the interchangeable system of manufacture. The Civil War ended slavery; but it was already doomed, for nowhere has the slave been able to compete with the free mechanic. In 1850 the value of our manufactures for the first time exceeded that of agriculture. This relative position has been maintained ever since, except for a temporary reversal immediately after the panic of 1857.

In 1855 this country was on the

crest of a great wave of expansion of its internal commerce, due largely to the filling up of the Mid-West. The railroads were ceasing to be mere feeders to water routes and becoming trunk lines east and west. In 1852 the railroad reached Pittsburgh and the next year a "white-haired little Scotch devil" named Carnegie started to work for Tom Scott, the superintendent of that division. Later Scott became president of the road and his nervy little telegrapher drifted into the steel industry. Railroads reached Chicago from the East in 1853, St. Louis in 1855, and Kansas City in 1856. In 1850 there were in the west only a few scattered lines radiating from Cincinnati, Cleveland and Detroit, none of them connecting with the East. Ten years later a whole network had spread to the Mississippi and tentacles were reaching westward across Iowa and Missouri. A glance at the railroad maps of these two years tells the story better than pages of statistics, so only a few figures need be given. In 1830 we had 23 miles of railroad,

in 1840, 2815 miles, in 1850, 9021 miles, in 1855, 18,374 miles, an increase of 100 per cent in five years. In 1860 there were 30,626 miles, an increase of 250 per cent in a decade. The population of the country in 1855 was 27,256,000 an increase of 17.4 per cent in the five years from 1850. This is twice the rate of increase during the decade from 1920-30 just closed.

Two important increases in transportation facilities occurred in 1855. The Panama Railroad was opened and began long years of unheard of prosperity, supplanting the Cape Horn route and the Overland Trail, in the opening up of California. It might be noted in passing that the "clipper" ships, the last flowering of the sailing vessels, were just at their height. In 1854 the "Flying Cloud" had made its marvelous record from San Francisco to New York. Seventy-five per cent of our deep sea commerce was carried in American vessels and its tonnage was higher than at any time from then until 1915. But both the Cape Horn route and the clipper ship were



doomed. The Panama Railroad did for one and the iron steamer for the other. The gold pouring east via Panama from

California was no small factor in the prosperity and industrial expansion of these years.

More important than the opening of the Panama Railroad was the opening of the first canal at Sault Ste. Marie. We know now what this meant to the steel industry. Three years earlier John Fritz inspected some iron properties in northern Michigan and reported that there were only two steamers on Lake Superior. In 1855, the year the canal was opened, it carried 1445 tons of ore. By 1860 this had reached 117,000 tons. Today the present canals carry a total of eighty million tons, of which over fifty million tons is iron ore, and they constitute the throat of the ore supply of the American iron industry.

Through the widening network of railways and the Erie Canal, the Mid-West was giving an enormous impetus to the American iron industry. As yet it was still in the pioneer stage and had few manufactures, but its great and growing needs stimulated every factory on the seaboard. Not only was the market enlarging but also the supply of basic raw materials. Waterbury, with the Naugatuck Valley, was already the center of the brass industry. The supply of copper was brought to it largely by the tin peddlers in the form of the scrap copper which they took in exchange for New Britain wares. The tin peddler was our first inter-state trader whose service to this country is not appreciated today. With the opening of the "Soo" Canal the Michigan Peninsular copper supply became available.

In this year American tool builders began a leadership which they have always retained. The American machines and manufactured products shown at the London Exposition in 1851 had given the English a bit of a shock. As a result a Commission was sent to this country in 1853. The great Joseph Whitworth, idol of English mechanics was a member, and their report, signed also by Nasmyth, the inventor of the steam hammer, decided the English Government to incorporate the "American System" of interchangeable manufacture in the new arms factory at Enfield. Scores of machine tools were built



Rail transportation has been the backbone of American Industry. One can measure the crudeness of industry, in 1850, by this map, which shows all of the railroads of that time.

for it at Windsor, Chicopee and elsewhere, and experienced American workers were sent to Enfield to install them.

For a generation American mechanics had been making machine tools. The standard tools, such as the lathe, planer and shaper, had been invented in England in the early part of the century but they were unobtainable here due to England's embargo on machinery and the inaccessibility of the small American shops. Our mechanics therefore began to develop tools independently. Some old wooden-bed lathes, made 100 years ago, can be seen today in the Machine Age Exhibit of the Museums of the Peaceful Arts in New York City. The textile industry about Lowell called into existence shops at Nashua and Manchester, N. H., and North Chelmsford, Mass., all of which built tools. By 1840 Worcester was building machine tools and in 1855 was the acknowledged center of the industry. The names of Pond, Whitcomb, Blaisdell, Coes and Reed still figure in our tool industry. Much

of Worcester's prominence was due to a number of large buildings which rented space with power to those who wanted to start in a small way. One of these was Merrifield's, a three story building 1100 ft. long, with 50 tenants each employing from two to 800 men. Most of the prominent Worcester tool builders began manufacture in this building.

In Fitchburg S. W. Putnam was at the height of his career as a builder of tools and engines. At Chicopee Falls the Ames Brothers, little known today, employed 1000 men and were building gun machinery for England and later for nearly every government in Europe. Their output was certainly catholic as it included also bronze statuary, Boydon water wheels, mill machinery, and a full line of machine tools. In this they were not alone. The "broad-sides" of L. W. Pond and the Windsor Manufacturing Company cover a range as wide and have a footnote which in effect says, "If you don't see what you want, ask for it. We'll make it." These broadsides were large sheets about



Ten years later, in 1860, a network of rails had spread over the eastern half of our country. This rapid expansion led to a demand for rails that was a chief factor in establishing our steel industry.

2 ft. by 3 ft., listing and illustrating the various machines made and were distributed freely and nailed up as posters on the walls of shops all over the country. As they were printed on cheap paper, and soon grew dusty and dirty, few have survived.

By 1855 Joseph R. Brown in Providence was turning from clocks and instruments to the manufacture of machine tools and scales. He had invented a linear dividing engine in 1850 and built two more, one in 1854 and one in 1859. These have been in use down to this day. He brought out the Vernier Caliper in 1851, but it went slowly as only four were sold the first year. The next year he asked the New York agent to return one on stock there because he needed it for some work and did not have another in the shop. In 1852 Samuel Darling in Bangor, Me., built another graduating engine on a radically different principle and began a lively competition which was at its height in 1855. A truce was called the next year, 1856, and the partnership of Darling, Brown

and Sharpe formed. The business centered at Providence and continued under that name until 1892 when Darling's interest was bought out. In 1855 also Brown and Sharpe began developing the system of wire gages and sizes known by their name. The micrometer and caliper did not come until twelve years later.


One of the most brilliant shops of the time was that of Robbins & Lawrence at Windsor, Vt. When it was built it was miles away from the railroad and was never large, but few plants have had as great influence on American manufacturing. Three men, F. W. Howe, R. S. Lawrence, and F. M. Stone, worked there in the early 50's. In their hands the turret lathe, drop hammer, milling machine and many other tools took their present forms. They manufactured the first repeating rifle, developed gun machinery and with the Ames Company, in Chicopee, supplied the tools for the Enfield Armory. From this shop, these men, and those who worked for them, may be traced lines of in-

fluence to many well known, modern firms, such as Jones & Lamson Machine Company, National Acme Company, White Sewing Machine Company, Fellows Gear Shaper Company, Wheeler and Wilson, Brown and Sharpe, Bryant Chucking Grinder Company, Weed Sewing Machine Company, Pope Manufacturing Company, who built the Columbia bicycle and many others.


The most significant event in American manufacture which occurred in 1855 was the opening of the Colt Armory in Hartford. It had been built in 1853 and 1854. Colt had invented his revolver 20 years before, but had had slow work introducing it. The tide turned, however, with the Mexican War, and from then on his career was one of rapid and spectacular success. His early revolvers were made at the Whitney Armory in New Haven. He followed every detail of their manufacture and determined to start his own plant. It was characteristic of his daring that although he was just started and with little capital, he outbid two others to obtain the most brilliant superintendent in New England, E. K. Root. His salary, said to be \$25,000, was staggering for those days. Root came to Hartford and designed and built the new armory and its machinery. He was as daring in his day as Ford in our generation, and along much the same lines. He abolished all hand work, put everything on to jigs and fixtures and spent more for tooling up his machines than for the machines themselves. They said he was crazy. But the immediate and overwhelming success of the plant did more perhaps than anything else to establish the interchangeable system of manufacture on a firm basis. The opening of this factory alone would make 1855 a significant year in industrial history.

In this armory worked Christopher Spencer, who applied cam-control to the turret lathe and made it automatic—a wonderful man, who died in 1922 and whose work when nearly 90 competed with the best we have today. Francis A. Pratt and Amos Whitney—it is hard not to call them Pratt & Whitney—worked there also and a few years later started their own plant. In one or the other of these plants worked Gleason, who founded the Gleason Works, Bullard, of the Bullard Machine Tool Company,

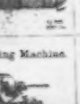





DIAMOND POINTED DRILL.
For large diameters. Light, to drill for
mineral water.




DIAMOND POINTED DRILL.
For large diameters. Light, to drill for
mineral water.




Small Trip Hammer.
With Iron Hammer.




Index Milling Machine.




DIAMOND POINTED DRILL.
With Heavy Spindle, and Frame for Large Trenches. Min.
Din. Open Dies, &c.




DIAMOND POINTED DRILL.
With Heavy Spindle, and Frame for Large Trenches. Min.
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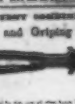
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Din. Open Dies, &c.




Index Milling Machine.




Index Milling Machine.




LARGE PATENT IMPROVED LATHE.




Double Circular Saw Mill.
With Patent Extension Feed.




LARGE PATENT IMPROVED LATHE.




Single Circular Saw Mill.
With Patent Extension Feed.




NEW ROLLING MACHINE.



High Power Revolver.



Punching Press.



Rolling Machine.

The Mather Manufacturing Co., Windsor, Vermont, manufactures a large variety of first-class Machine's Tools, Machinery for Guns, Planes, Sewing Machines, Workbery for Special Purpose, Hardware, &c., including the following list:

Descriptions, prices, lists and full information furnished on application. All kinds of Machinery made to Order.

WINDSOR & SUNS, PRINCIPAL, 50 CROWN STREET, NEW YORK.

MACHINE tool advertising in the early '50's was chiefly through the medium of "hand bills." These "broadsides," as they were called, were nailed up as posters on the walls of shops throughout the country.

marine work. The Allaire Works, the oldest, founded by Robert Fulton, had built the Savannah, the first steamer to cross the Atlantic. Others were the Novelty Works, The Delamater Iron Works, closely identified with John Ericson, Morgan Iron Works, Continental Iron Works, and Fletcher, Harrison and Company. Robert Hoe, long established, was building printing presses for all the principal newspapers in America and many in Europe. Isaac Singer had moved from Boston to New York and was building sewing machines in a little shop "up over the New Haven depot." In 1855 a violent litigation arose between Elias Howe, Singer and Wheeler & Wilson. Howe's basic patent was sustained; the rest took license under it and settled matters amicably between themselves by cross licens-

Except for New York and Philadelphia, there was little manufacturing outside of New England, and aside from agricultural machinery, none west of the Alleghenies. Clark says that less than \$1,000 per year of the eastbound freight on the Erie Canal was classified as manufactures. Cincinnati was the only western city with a population of 100,000. Iron works here were busy building and repairing river craft and engines. Later this industry died out with the river trade, and the mechanics turned their attention to machine tools, and the city became a great tool building center. But this is a long story and came a generation later.

The period about 1855 was particularly significant in the American iron industry and marked a great geographical shift. Before the revolution iron was made on a small scale in all of the thirteen States but Georgia. Most of it, however, came from bog ores in eastern Massachusetts, Rhode Island and Connecticut. This supply gradually declined and had just about ceased. The next chief supply came from the hills stretching from southern Vermont down through the

Warner and Swasey, Henn and Hackewessel who developed the multipindle automatic lathe, Foote of Foote, Burt & Company, Bardons of Bardons and Oliver, Johnston of Potter and Johnston, J. N. Lapointe, and Gardner who invented the Gardner grinder.

Down in Philadelphia two men, William Sellers and William P. Bement, were running Worcester hard



for the leadership in tool building. They had started a few years before, Sellers in 1848 and Bement in 1851, and both spe-

cialized in heavier tools than were built in New England. They were among the first to concentrate on tool building and led the country in tools for the rapidly growing railway shops. In 1864 Sellers proposed the system of screw threads now standard throughout the United States. During his long, useful life, he acquired a leadership in this country scarcely second to that of Whitworth in England. Matthew Baldwin had been building locomotives for 22 years. By 1855 he was building more than a hundred a year and employed 800 men; and William Norris—now almost forgotten—was selling locomotives all over Europe.

In New York there were several famous plants engaged mainly in

THOSE engaged in machining metals will be interested in the "architecture" of these tools of 1855. Our present day achievements in tool building will probably seem as archaic to those of the year 2000 as these do to us of today.

Berkshires, across the Hudson and into northern New Jersey. In 1855 this district was still active but falling behind relatively. Most of these furnaces used charcoal for fuel. About 1840 smelting with coal came in and the Delaware, Lehigh and Schuylkill Valleys in eastern Pennsylvania became the center of production. In 1850 Pennsylvania ranked first, Ohio second and New York third. The production of anthracite iron passed that of charcoal iron in 1855. The figures at this time are as given at bottom of page.

About a third of the value given for "bituminous" in 1855 was smelted by coke, which began to be used about 1850, and was increasing rapidly. With its general introduction and the use of the hot blast, iron production moved westward toward the soft coal fields and Pittsburgh became the great iron center it has always remained. The largest mills of that date were the Lackawanna Iron & Coal Company, whose president, John H. Scranton, had purchased in 1840 a site with five houses on it and built the town named after him; the Phoenix Iron Company at Phoenixville; and the Cambria Iron Company at Johnstown, built in 1854, and rebuilt after a fire in 1857. Here John Fritz went in 1854, and was working out his first three-high rolls. This mill was built to roll rails, the demand for which reflected the tremendous growth of the railway system. It is claimed that the first 30-ft. rail rolled in America was rolled in this mill in 1855. The total production of iron rails rose from 87,864 tons in 1853 to 180,018 tons in 1856. Johnstown was a busy place even in those days, but a raw one. A stage coach driver told one of Fritz's friends "it was a damned shame to spoil such a nice piece of ground to build such a town on it."

Year	Anthracite Iron	Charcoal Iron	Bituminous Iron	Total Net Tons
1855	381,866	339,922	62,390	784,178
1860	519,211	278,331	122,228	919,770

LUCIUS W. POND

MANUFACTURER OF

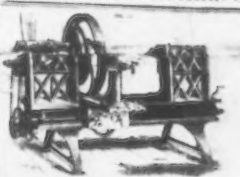
PLANING MACHINES FOR IRON

Capable of Planing from 3 to 30 feet Long; Weighing from 1000 pounds to 30 tons.

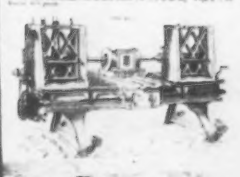


ALSO...ENGINE LATHES, OF ALL SIZES.

From 6 feet Bed, 18 inch Swing, to 55 feet Bed, 8 feet Swing.


SHOP IN MERRIFIELD'S BUILDING, ... UNION STREET, ... WORCESTER, MASS.




DESCRIPTION OF LATHES, PLANING MACHINES, &c.

ENGINE LATHES.





With my New Machinery, and Improved Patterns, I am prepared to furnish to all orders of all sizes and descriptions, of Improved Machinery, and to repair and rebuild all old machinery.

Purchasers will do well to call and examine for themselves before buying, as the above-described Machinery are to be seen in operation at the Plant of Messrs. POND & CO., WORCESTER, MASS.

RELIABLE REFERENCES GIVEN IF DESIRED. All Goods Delivered at the Depot, Worcester, Free. Sending Orders.

By Order of Edward S. Kelly, 1855, in Place of Lucius W. Pond.

Pittsburgh had about 50,000 inhabitants. It had begun rolling iron about 1820. The Shoenberger Works of the American Steel & Wire Company, established in 1824, are said to be the first west of the Alleghenies for the manufacture of finished iron products and it is today the oldest unit of the United States Steel Corporation. By 1855 a single mill in Pittsburgh had twice the capacity of all the mills it had in 1830, practically all of them for iron. A statement by a writer in 1854 is a warning to

prophets. "In Pittsburgh attempts have been made to manufacture steel, but we doubt whether an article of good quality can ever be produced in that region."

William Kelly, a native of Pittsburgh, had been developing "Kelly's Air-boiling Process" down in Edysville, Ky., since 1847, prior to and independent of Bessemer. Bessemer himself, in England, began his work in 1854 and was granted patents in 1855 and 1856. He was blocked in this country by Kelly's claims. Both Bessemer and Kelly made iron, but steel



1446—The Iron Age—75th Anniversary Number

in heavy demand and opportunities for individual advancement good. In New England, and more or less elsewhere, there was an institution now almost unknown—the contractor—who was quite distinct from the salaried foreman of today. A good mechanic who gave promise of being a good executive was given some part or class of parts to bid upon. He named a unit price at which he would produce the parts. The contractor hired all the workmen, directed their work, and was responsible for its quality. The management furnished the buildings, machines, power, etc., paid the workmen, and built any special jigs and tools he called for, charging these against his contract. The margin, if any, between these costs and the price was his profit. Many of these contractors made comfortable incomes and laid by money enough to start in business on their own account. The system has fallen into disuse with the increasing size of industry, but none could have been devised to develop better a generation of successful manufacturers. It enabled an able mechanic to acquire most of the experience needed to run a business without having to buy it with his own capital. Many of our best tool manufacturers began in just this way—Pratt, Whitney, Warner, Swasey and many others.

All the metal industries in 1855, and for many years thereafter, were on an empirical basis, rule of thumb if you wish to call it that. The colleges almost without exception were still intrenched in the old classical traditions inherited from the English universities and took little or no interest in science, and less in applied technology. Rensselaer Polytechnic had been turning out civil engineers for thirty years who were already giving good account of themselves. In 1848 Yale College had grudgingly allowed a few professors on their

own account to start what is now the Sheffield Scientific School, but it had not as yet exerted influence on industry. If there were any college men in the iron industry they kept it quiet until they were well enough established to admit it. Scientific metallurgy was unknown, but empirical methods were improving steadily, and here and there progressive managers were casting furtive glances at what the scientific fellows were doing, and now and then picked up a good thing. In fact, the long delay before industry and science began to work wholeheartedly together was due quite as much to the attitude of the colleges as that of industry.

In the light of even this brief review we can say that there has seldom if ever been a race of mechanics as brilliant as the generation of American mechanics in 1855. Every one of them was a self-made man with only modest schooling, but all of those who lived long enough became leaders in applying science to every phase of industry, and were active supporters of engineering education which spread over the country fifteen or twenty years later.

One of the great influences in American industry has been the technical press. It has helped to bring science and industry together, sought out and disseminated the best of current practice, spread

the knowledge of the arts, and has been an active element in our industrial progress. The birth of THE IRON

AGE, which has held a leadership in this field for 75 years, is not the least of the events which make 1855 significant.

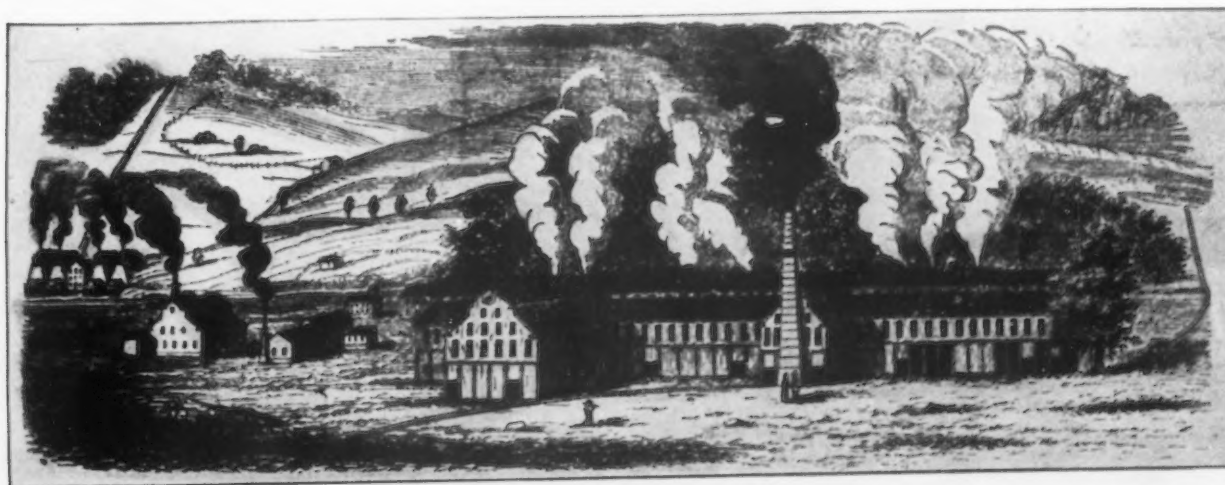


Henry Bessemer Turns His Genius To Ships

THE ship by which Mr. Bessemer is supposed to render seasickness all but impossible is described by him in a letter to the *London Times*. He does not propose to make a ship that shall be motionless except in the direction of its course for against such an unyielding body the waves would dash as against the rocks. If, he claims, the centers upon which a vessel pitches and rolls are made coincident with the axes on which its salon is suspended, by suitable mechanism, and provided with a sufficiently heavy counterbalance weight beneath the center of gravity, the tendency of this weight will be at all times to keep the salon poised on the center of the vessel's motion and therefore free from pitching or rolling, its floor always remaining quiet and horizontal, while the vessel itself may be tumbling about the center of suspension without regard to the heads or stomachs of its passengers.

The most convenient form for such a salon is circular, surmounted by a dome lighted at the top with glass. It is proposed to make this circular salon of Mr. Bessemer's ship 50 ft. in diameter, 28 in height and with a gallery extending around its interior about 9 ft. from the floor. A continuous couch around this gallery would accommodate sixty persons.

One of the "big" plants of 1854 was the Cambria Iron Works, of Johnstown, Pa. It was here that the first 30 ft. rail made in America is said to have been rolled. From the looks of the smoke and steam in this picture, business must have been good.



PROGRESS IN WAGES AND LIVING STANDARDS OF LABOR

BY MAGNUS W. ALEXANDER
NEW YORK

President, National Industrial Conference
Board, Inc.

INDUSTRIAL economists have come to accept the belief that the prosperity of our country largely depends upon the earning and buying power of our workers. If this be so, it is important for the responsible men of industry to be in possession of the facts concerning the trend of wages and the standard of living.

Mr. Alexander, who traces the changes in wages and living standards from 1855 to the present day in this article, emphasizes the fact that the World War brought about a new cooperation between the employer and the employed. This is significant of progress in the years to come.

IN endeavoring to present data relating to wages and standards of living of the American wage-earner over such an extended period as the last seventy-five years, the investigator labors under a serious handicap, for the data collected during most of this period are much less comprehensive than those assembled by various governmental and private agencies today. The data covering the middle decades of the last century, in particular, are very fragmentary, while those relating to the later decades of that century are much less extensive in





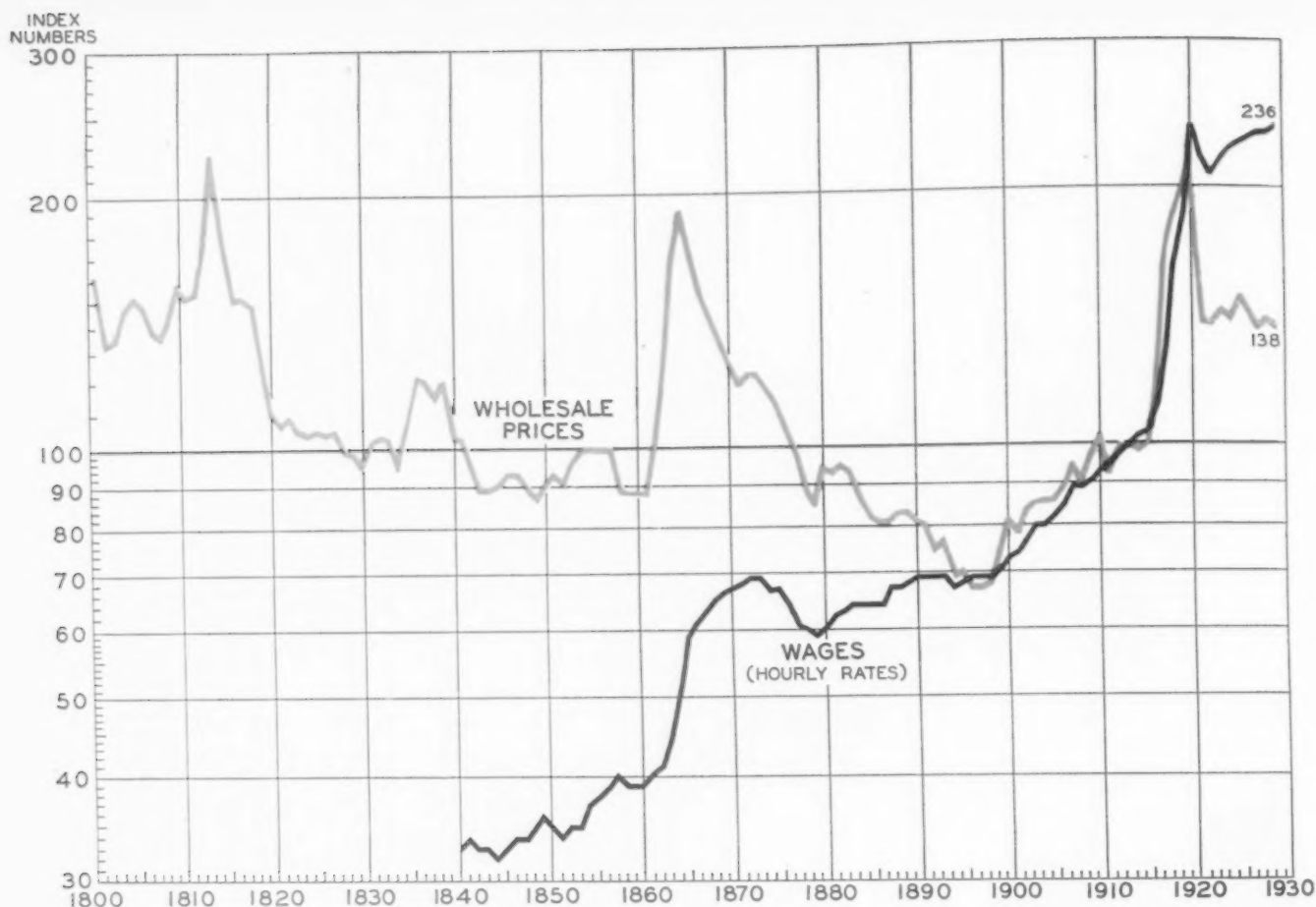
AMERICAN STANDARD OF LIVING

scope than those collected at the present time. However, the United States Bureau of Labor Statistics has prepared, on the basis of such data as are available, a series of index numbers of hourly wage rates from 1840 to 1926 for all industries, except agriculture, which, used in conjunction with data compiled by the National Industrial Conference Board, will permit calculation of the approximate hourly rates of wages during the last seventy-five years.

Taking average hourly earnings of employees in manufacturing industries, as shown by data compiled by the Conference Board, and applying to them the above mentioned index numbers, the results stated below are obtained. In considering these results, it should be kept in mind that the indexes of the Bureau of Labor Statistics comprehend all classes of workers, except those engaged in agriculture, whereas the Conference Board data relate only to wage-earners in manufacturing industries. Proceeding on the basis stated above, it is found that the average hourly wage rate for the year 1855, the beginning of the seventy-five-year period, was 9.4 cents. This rate rose rapidly during the Civil War years, standing at 14.3 cents in 1865, an increase of 50 per cent, and continuing to 17 cents in

1872, after which it gradually declined to 14.5 cents in 1879. During the following decade it rose slightly, again reaching 17 cents in 1890, at which it remained practically stationary for the next ten years. From 17.9 cents in 1900, the hourly rate rose steadily to 24.6 cents in 1913. Thereafter, the rise was rapid, increasing to 57.5 cents in 1920, an increase during the war period of 133.7 per cent. Between 1920 and 1921, the hourly wage earnings dropped to 51.5 cents, a decline of 6 cents, or 10.4 per cent. The following year, a further decline of 0.3 cents occurred, after which average hourly earnings climbed steadily, reaching 58 cents in 1929. From the year 1855 to 1913, the increase in the hourly rate was 15.2 cents, or 161.7 per cent; from 1913 to 1929 the increase was 33.4 cents, or 135 per cent. For the entire period from 1855 to 1929 the wage increased slightly over six-fold.

While these figures show the absolute increase in hourly wage rates, they do not, of course, necessarily mean that the worker was better off in these later years than at the beginning of the seventy-five-year period. Whether his real income, that is, the purchasing power of his hourly earnings, was greater at any time since 1855 than in that year depends on what he had to pay for the articles that comprised his individual or family budget. Satisfactory data relating to prices paid by the workingman for articles of consumption, and the quantities of the various articles comprehended in his expenditures, are not available for the greater part of the period in question. We can, however, get a rough approximation of the purchasing power of his wages by comparing their money value with wholesale prices. The accom-



Prices and wages in the United States from 1801 to 1930. This chart presents a picture of the long term trend in prices and wages as measured respectively by index numbers of wholesale prices in general, and by wage rates in non-agricultural industries. (Base, 1913 = 100)

panying chart, prepared by the National Industrial Conference Board, on the basis of wholesale commodity prices and of the above-mentioned index numbers of wages of the Bureau of Labor Statistics, as supplemented by data compiled by the Conference Board, shows that, except for a period of about thirty years following the Civil War and for the period since the World War, commodity prices and wage rates followed the same general trend throughout the seventy-five-year period. This would indicate that, except in the periods mentioned, the position of the wage-earner was not materially affected by the increases in his hourly wage earnings. In the two periods mentioned, however, the real income of the wage earner on an hourly basis was substantially increased. During these two periods average hourly wage earnings fell below war levels for only brief periods, while wholesale prices, after the Civil War, declined over a long period of years, and, after the World War, dropped sharply in 1920 and 1921 and, after

exhibiting a fair degree of stability from the latter part of 1922 to 1929, have since continued their downward movement.

Data are not available to calculate with any degree of accuracy the effect on the worker's economic status of changes in hourly wages and wholesale prices growing out of and following the Civil War, but the more comprehensive data collected in recent years make it possible to estimate with a fair degree of accuracy the effect on the worker's real income of changes in prices and wages occurring during and since the World War. From 1914 to 1929, according to data compiled by the Conference Board, the purchasing power of the wage-earner in manufacturing industries, based on the relation of hourly earnings to cost of living, increased 47 per cent. The weekly earnings of the above-mentioned group of wage-earners, which take into account changes in hours of work and are, therefore, a more accurate indication of wage-earners' income than are hourly earnings, show a gain in

purchasing power during the period of 40 per cent. It may be noted, in this connection, that other groups of wage-earners, which are embraced in the Conference Board data, also enjoyed substantial increases in real earnings during the period mentioned. For these other wage-earners real weekly earnings increased during the above-mentioned period, as follows: In electric utilities, 38 per cent; in gas works, 33 per cent; and on the railroads, 30 per cent. Comprehensive and reliable data are not available as to earnings of building trades workers. However, wage rates per hour of building workers were 46 per cent higher in purchasing power in 1929 than in 1914.

That the economic status of the American wage-earner has greatly improved in recent years is further borne out by other statistical evidence. Savings bank deposits and assets of building and loan associations and life insurance companies, which to a large extent represent savings of wage-earners, have shown an enormous increase since the turn

of the century. According to figures compiled by the Savings Bank Division of the American Bankers Association, total savings deposits for continental United States rose from \$6,835,494,000 in 1910, the earliest year for which comprehensive data are available, to \$28,217,656,000 in 1929, an increase of \$21,382,162,000, or over 300 per cent. Building and loan association assets increased from \$614,119,000 in 1900 to \$8,016,034,000 in 1928, or slightly over twelve-fold, and life insurance assets showed a seven-fold increase, from \$1,742,000,000 in 1900 to \$14,392,000,000 in 1927.

One of the best indications of the rise in real income of the American wage-earner is the change in the proportion of his expenditures for the different items comprising his individual or family budget. Cost of living studies of the United States Bureau of Labor Statistics show, for example, that in the period 1900-1902 food comprised 43 per cent, and clothing, approximately 13 per cent of the expenditures of the family of the wage-earner, while in 1918-1919 the relative expenditures for these items were, respectively, 38 per cent and 16.6 per cent of the wage-earner's total outlay. This relative decrease in the proportion of expenditures for food and the proportionate increase in outlay for clothing indicates that food and other necessities are taking a proportionately smaller share of the wage-earner's income and that a larger proportion is, therefore, available for other purposes.

Concurrently with the rise in the income of the American wage-earner has come a progressive shortening in hours of work. The movement in the direction of shorter hours, how-

ever, did not make much headway prior to the World War. According to the United States Census of Manufactures for 1909, 39.2 per cent of wage-earners in manufacturing industries in the United States worked 60 hours per week or over, and only 7.9 per cent worked 48 hours or less. In 1914, the corresponding percentages were 26.9 and 11.8. The greatest change in the five-year period between 1909 and 1914 was in the proportion of workers working 54 and 60 hours per week. The proportion of wage-earners working 54 hours per week increased during the period from 15.4 per cent to 25.8 per cent, while the number working 60 hours per week declined from 30.5 to 21.1.

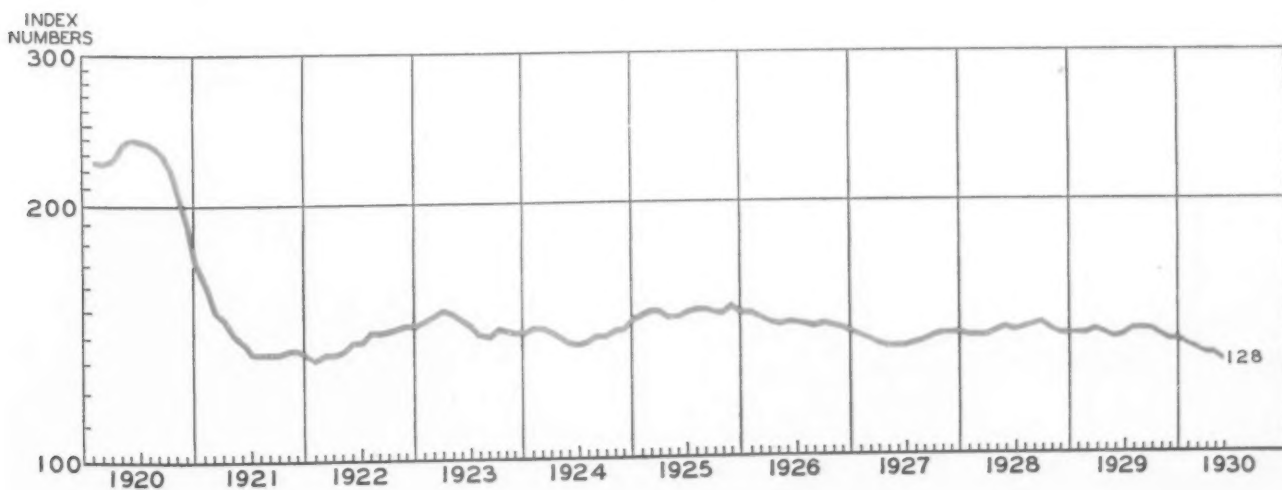
The war years witnessed a truly remarkable reduction in working hours. According to the United States Census of Manufactures for 1919, only 12.1 per cent of wage-earners in manufacturing industries worked 60 hours or over in that year, while the number working 48 hours or less increased from 11.8 per cent in 1914 to 48.6 per cent in 1919. The number working between 54 and 60 hours per week decreased from 22.1 per cent to 13.7 per cent, while the number working 54 hours was reduced from 25.8 per cent to 9.1 per cent. Data compiled by the Conference Board indicates a decline in the nominal work week for all wage-earners in manufacturing industries, from 55 hours in 1914 to 49.6 hours in 1929.

Enough has been said to indicate a remarkable improvement in earnings and standards of living of the American wage-earner during recent decades, particularly since the pre-war period. However, changes in recent years in the attitude of

American wage-earners and management toward each other and toward their common problems, and the implications of such changes for the future of American industry, should here be discussed, because of their bearing upon the whole wage problem.

The fact that most strikingly impresses foreign observers of industrial conditions in the United States is the spirit of cooperation that prevails generally between workers and management in American industry. In most foreign countries today, and until recent years in this country, the relations of management and workers have frequently been characterized by a spirit of non-cooperation, which has manifested itself, on the part of management, in an effort to keep wages at the lowest possible level and to grant other concessions to labor only when compelled to do so and, on the part of labor, to give no more for the wages received than was considered necessary in order to hold the job.

The attitude of management was inspired by the belief that the only way to hold down or reduce costs of production was to keep wages at a minimum. Wage rates and wage costs were regarded as synonymous. During periods of business expansion, when labor was in demand, there was a noticeable decline in the output of labor, and management, therefore, did not consider depressions in business as an altogether unmixed evil, since they gave management an opportunity to increase productive efficiency by weeding out inefficient workers. The alternating periods of decline and increase in labor efficiency, and the consequent efforts of management to correct



Monthly index numbers of wholesale prices, 1920-1930

these conditions in the way indicated, constituted a vicious circle; but this was the only method known to management by which the efficiency of labor could be increased.

Labor, on its part, did not scruple to take advantage of the situation when opportunity offered. During periods of expanding activity, when the supply of workers was not adequate, labor made its most exorbitant demands and sought to enhance its economic position at the expense of management. As in the case of management, labor saw no way of improving its position except by inflicting a corresponding loss on the other party in the productive process.

Fortunately, an opportunity to break out of this vicious circle was offered by the World War. In order to attain victory, management and labor sacrificed whatever temporary advantage either enjoyed, in the common effort to increase output. In so doing, however, it became evident that by cooperative effort production could be greatly increased, with resulting advantages to both workers and management. Both labor and management became conscious of the fact that it was not necessary for either party in the employment relation to suffer a disadvantage in order that the other could gain a corresponding advantage, but that both might prosper together. This new conception, it is true, was not sufficiently general to prevent attempts to liquidate the position of labor when the depression of 1920-1921 intervened. Nevertheless, the ability of certain concerns, by introduction of labor-saving machinery and improved administrative methods, to make profits and at the same time to maintain wages at high levels served to stimulate other employers to adopt similar policies, with the result that eventually the policy of high wages became firmly established throughout American industry.

The spread of the principle of high wages was, however, not entirely due to the recognition that

high wages and low costs of production may go hand in hand. It was in large part the result of the realization that the increased productive capacity of American industry required a corresponding increase in consumer purchasing power and that high wages contributed to that end. The productive capacity of American industry is today so great that, without the high purchasing power represented by high wages, production on anything like present levels would be impossible. For present-day American industry high wages are an economic necessity. We may, therefore, rest assured that in the years to come employers will make no wage cuts that are not dictated by absolute necessity. If any proof were wanted of the extent to which management of industry in this country is committed to the principle of high wages, such proof has been abundantly provided by the attitude and policies of management since the beginning of the existing business recession. Instead of reducing wages, as in the past, management generally, and with but few exceptions, has not only endeavored to keep wage rates at prevailing high levels, but has undertaken programs of plant renovation and improvement in order that unemployment may be kept at a minimum.

Great as have been the benefits to American wage-earners of cooperation between management and workers in industry, there is no reason why equal, or even greater, benefits cannot be attained by such cooperation in the future. Such benefits, however, will continue to accrue to employers and workers alike, only if sound policies are pursued in solving the future problems of industry. The great increase in productive output, and the consequent benefit to labor and capital, has been the direct outgrowth of technological advance and of improvements in administrative methods and industrial processes. And these developments, in turn, have resulted from

the freedom of management to utilize labor-saving machinery and to adopt more efficient methods when circumstances warranted. It is true that the introduction of more efficient machines has at times caused temporary hardships to workers who have been displaced by the machines, but in the long run technological developments vastly increase the opportunities for profitable employment for wage-earners. New inventions and scientific discoveries are not only increasing the utility of products now in use, but are creating entirely new products and industries. Productive operations incident to such developments will in the years to come provide employment for the workers displaced by machines in existing industries. In the interest, therefore, of both wage-earners and employers care should be taken that no obstacles be placed in the path of technological advancement. It is a sure road to continued improvement in the American standards of living.

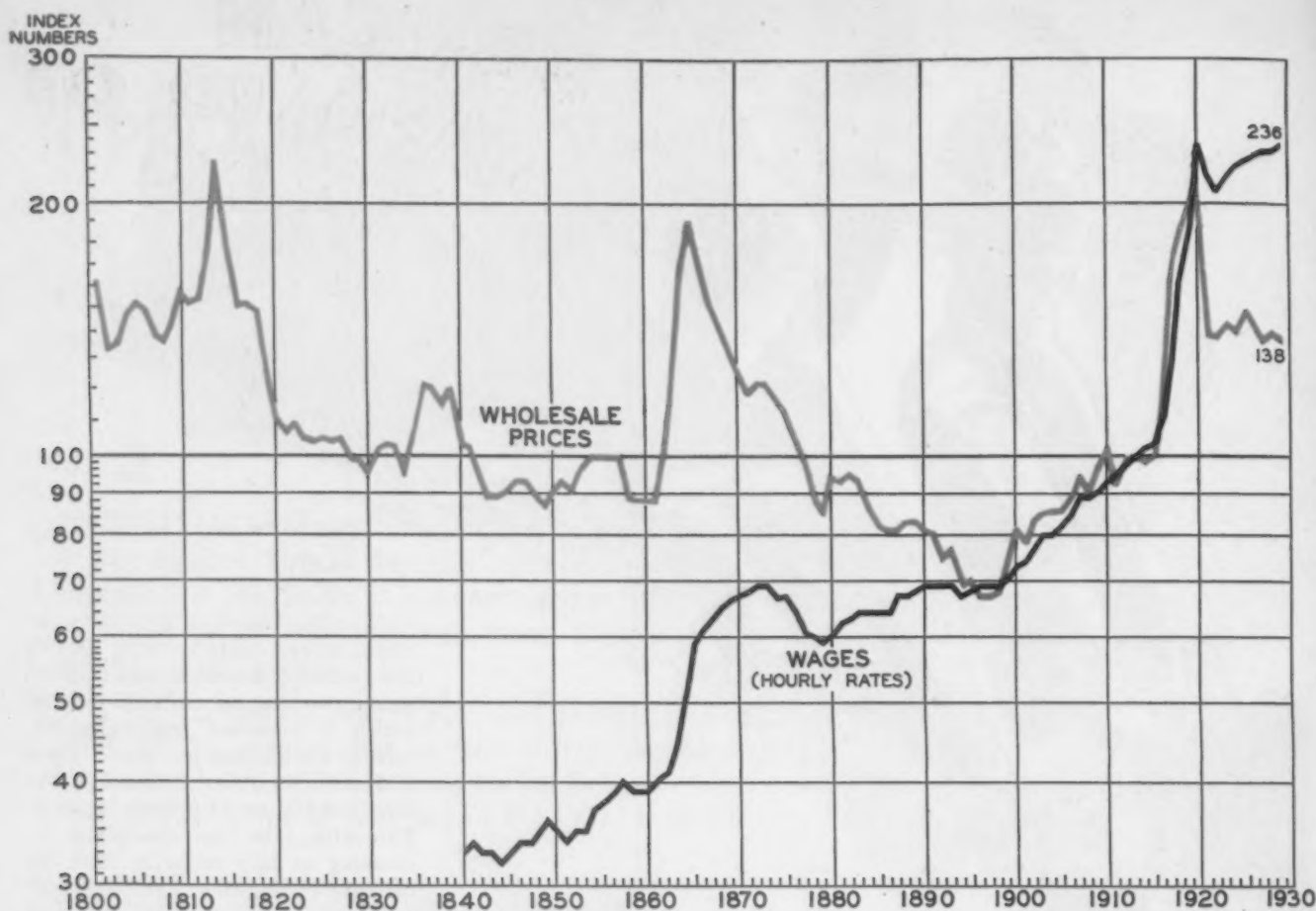
Rate of Production of Steel

A PAIR of 10-ton Bessemer converters some years ago made a record in one month of 4958 heats for a total of 50,547 gross tons. This makes an average of one heat for every 7 min. 24 sec., in every working day of that month. It represents about 1.35 tons of steel a minute.

Growth of production rate was rapid. In 1870 a pair of American converters had a maximum rate of 254 gross tons a week. Ten years later the output was 3433 tons a week. In 1889 it had jumped to 8549 tons a week. Ten years after that it reached 11,233 tons a week, as an average for a whole month. In 1903, which was at about the apex of Bessemer steel production, the maximum weekly output for a pair of vessels was 15,704 tons. During one-third of a century, therefore, the rate of production had increased about 62-fold.







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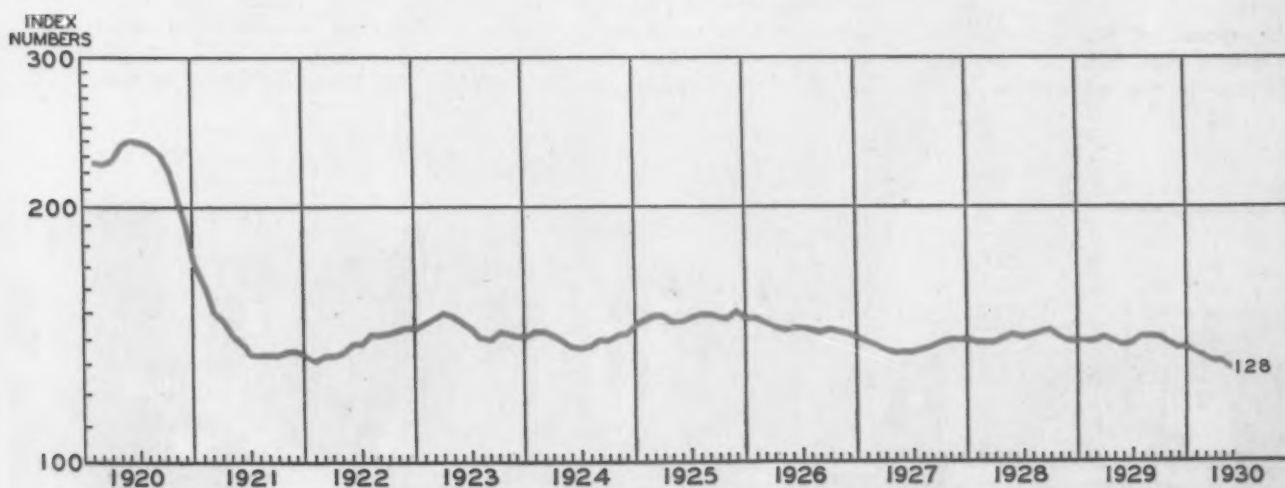
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American wage-earners and management toward each other and toward their common problems, and the implications of such changes for the future of American industry, should here be discussed, because of their bearing upon the whole wage problem.

The fact that most strikingly impresses foreign observers of industrial conditions in the United States is the spirit of cooperation that prevails generally between workers and management in American industry. In most foreign countries today, and until recent years in this country, the relations of management and workers have frequently been characterized by a spirit of non-cooperation, which has manifested itself, on the part of management, in an effort to keep wages at the lowest possible level and to grant other concessions to labor only when compelled to do so and, on the part of labor, to give no more for the wages received than was considered necessary in order to hold the job.

The attitude of management was inspired by the belief that the only way to hold down or reduce costs of production was to keep wages at a minimum. Wage rates and wage costs were regarded as synonymous. During periods of business expansion, when labor was in demand, there was a noticeable decline in the output of labor, and management, therefore, did not consider depressions in business as an altogether unmixed evil, since they gave management an opportunity to increase productive efficiency by weeding out inefficient workers. The alternating periods of decline and increase in labor efficiency, and the consequent efforts of management to correct



Monthly index numbers of wholesale prices, 1920-1930

these conditions in the way indicated, constituted a vicious circle; but this was the only method known to management by which the efficiency of labor could be increased.

Labor, on its part, did not scruple to take advantage of the situation when opportunity offered. During periods of expanding activity, when the supply of workers was not adequate, labor made its most exorbitant demands and sought to enhance its economic position at the expense of management. As in the case of management, labor saw no way of improving its position except by inflicting a corresponding loss on the other party in the productive process.

Fortunately, an opportunity to break out of this vicious circle was offered by the World War. In order to attain victory, management and labor sacrificed whatever temporary advantage either enjoyed, in the common effort to increase output. In so doing, however, it became evident that by cooperative effort production could be greatly increased, with resulting advantages to both workers and management. Both labor and management became conscious of the fact that it was not necessary for either party in the employment relation to suffer a disadvantage in order that the other could gain a corresponding advantage, but that both might prosper together. This new conception, it is true, was not sufficiently general to prevent attempts to liquidate the position of labor when the depression of 1920-1921 intervened. Nevertheless, the ability of certain concerns, by introduction of labor-saving machinery and improved administrative methods, to make profits and at the same time to maintain wages at high levels served to stimulate other employers to adopt similar policies, with the result that eventually the policy of high wages became firmly established throughout American industry.

The spread of the principle of high wages was, however, not entirely due to the recognition that

high wages and low costs of production may go hand in hand. It was in large part the result of the realization that the increased productive capacity of American industry required a corresponding increase in consumer purchasing power and that high wages contributed to that end. The productive capacity of American industry is today so great that, without the high purchasing power represented by high wages, production on anything like present levels would be impossible. For present-day American industry high wages are an economic necessity. We may, therefore, rest assured that in the years to come employers will make no wage cuts that are not dictated by absolute necessity. If any proof were wanted of the extent to which management of industry in this country is committed to the principle of high wages, such proof has been abundantly provided by the attitude and policies of management since the beginning of the existing business recession. Instead of reducing wages, as in the past, management generally, and with but few exceptions, has not only endeavored to keep wage rates at prevailing high levels, but has undertaken programs of plant renovation and improvement in order that unemployment may be kept at a minimum.

Great as have been the benefits to American wage-earners of cooperation between management and workers in industry, there is no reason why equal, or even greater, benefits cannot be attained by such cooperation in the future. Such benefits, however, will continue to accrue to employers and workers alike, only if sound policies are pursued in solving the future problems of industry. The great increase in productive output, and the consequent benefit to labor and capital, has been the direct outgrowth of technological advance and of improvements in administrative methods and industrial processes. And these developments, in turn, have resulted from

the freedom of management to utilize labor-saving machinery and to adopt more efficient methods when circumstances warranted. It is true that the introduction of more efficient machines has at times caused temporary hardships to workers who have been displaced by the machines, but in the long run technological developments vastly increase the opportunities for profitable employment for wage-earners. New inventions and scientific discoveries are not only increasing the utility of products now in use, but are creating entirely new products and industries. Productive operations incident to such developments will in the years to come provide employment for the workers displaced by machines in existing industries. In the interest, therefore, of both wage-earners and employers care should be taken that no obstacles be placed in the path of technological advancement. It is a sure road to continued improvement in the American standards of living.

Rate of Production of Steel

A PAIR of 10-ton Bessemer converters some years ago made a record in one month of 4958 heats for a total of 50,547 gross tons. This makes an average of one heat for every 7 min. 24 sec., in every working day of that month. It represents about 1.35 tons of steel a minute.

Growth of production rate was rapid. In 1870 a pair of American converters had a maximum rate of 254 gross tons a week. Ten years later the output was 3433 tons a week. In 1889 it had jumped to 8549 tons a week. Ten years after that it reached 11,233 tons a week, as an average for a whole month. In 1903, which was at about the apex of Bessemer steel production, the maximum weekly output for a pair of vessels was 15,704 tons. During one-third of a century, therefore, the rate of production had increased about 62-fold.



1452—The Iron Age—75th Anniversary Number

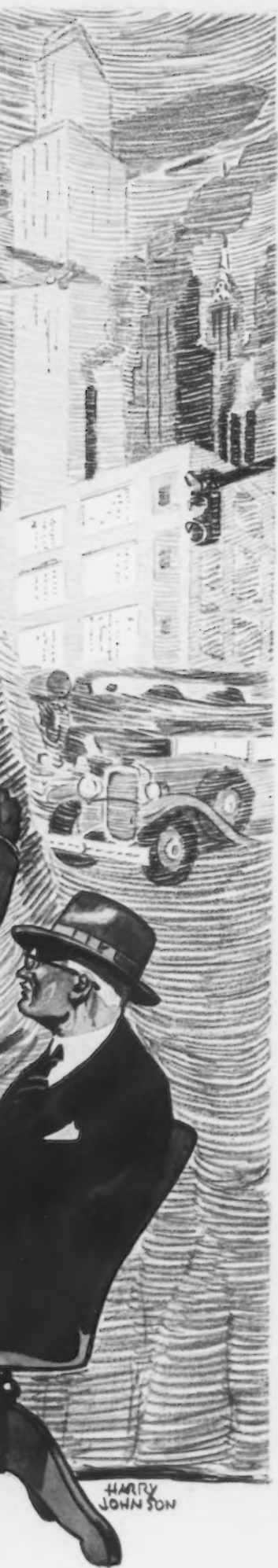


A NEW PERSPECTIVE of TIME and PROGRESS

† These six men, born at seventy-five year intervals, measure, in their overlapping life-spans, the entire course of American history. † Thirty-eight more such life-spans take us back to the beginning of recorded history, to the days of King Tutankhamen and the pyramid builders. † Greater progress has been made in Science, Invention and Industry during the lifetime of the present-day septuagenarian than was made in all of the life spans which preceded his. † Can it be thought that industrial and social progress, having so recently ceased to creep, shall have exhausted the possibilities of still faster progression in one mere lifetime?









ALUMINUM ALLOY PROGRESS

It is a common impression that the aluminum alloys of today are a comparatively recent development. This is true so far as they are commercially concerned. If, however, their history is investigated, it will be found that the early work dates back many years.

From a reliable authority the following facts have been obtained which show that the investigation of aluminum alloys apparently began shortly after aluminum was first made available in coherent form by Deville about 1855—the year THE IRON AGE was started. Aluminum-silicon alloys were investigated at a fairly early date, but little practical use resulted until much later.

Aluminum - magnesium alloys, sometimes called magnalium, were probably used on a small scale between 1890 and 1900. Early in the present century the aluminum-copper alloys and the aluminum-zinc alloys were in use, and a little later came alloys of the ternary group, such as aluminum-copper-zinc. Carpenter and Edwards published an intensive investigation of the aluminum-copper alloys in 1907.

Wrought alloy 3S, containing 1.25 per cent manganese, which has been in use for many years for cooking utensils and other products, was developed by Dr. E. Blough in 1906.

Rise of Strong Alloys 20 Years Ago

The beginning of the present strong alloy industry and the discovery of the possibilities of heat treatment apparently took place about 1907 to 1911. Two names chiefly associated with this are Alfred Wilm and August Claessen. Development of Y alloy is credited to Dr. Walter Rosenhain during work which he conducted, shortly before the war, in the National Physical Laboratory in England.

About 1920 Aladar Pacz disclosed his process for refining the structure and improving the physical properties of cast aluminum-silicon alloys by treatment of the molten

alloy shortly before casting with an alkaline fluoride flux. Metal thus treated is said to be "modified" as distinguished from untreated metal which is called "normal." The modified 13-per cent silicon alloy, developed by Pacz, has been known as Alpax, silumin, and also as Alcoa No. 47 alloy.

From 1919 until now there have been intensive alloy developments conducted by the Aluminum Research Laboratories of the Aluminum Co. of America. Some of these developments are briefly as follows:

Heat-Treated Castings: Toward the end of the war, the necessity for ductility became apparent and from 1919 to 1921 heat-treated 195 alloy castings, containing about 4 per cent copper, were developed by Jeffries and Archer and put on the market.

Strong Alloys: Difficulties encountered in the fabrication of duralumin led to the development, about 1919 to 1921, of the alloy 25S. This alloy, substantially the same in tensile properties as duralumin, possessed much better hot-working properties and is credited to Jeffries and Archer. The alloy 51S also was developed about this time. It is more workable than 25S and has a yield point somewhat higher than duralumin. Other alloys in this class are known as Alcoa alloys, C17S, and 427S, sometimes referred to as super-duralumin.

Aluminum-Silicon Alloys: The interesting work of Pacz on modified 13-per cent silicon alloy led to extensive study of the use of silicon in aluminum alloys. One of the most outstanding accomplishments of this study is the increased field of pressure die castings made possible by the provision of alloys with much superior casting properties. These include binary aluminum-silicon alloys containing about 8 to 13 per cent silicon, and several complex alloys containing mostly copper but sometimes nickel and other elements. The principal use of aluminum-

silicon alloys for sand casting has been in the form of 13-per cent silicon alloy in the normal rather than the modified condition, an alloy now widely employed in the use of aluminum in architecture. The field of permanent mold castings has been notably increased by the development of alloys containing silicon to facilitate casting.

Recent Developments

Low-Expansion Piston Alloy: The leading problem in the use of aluminum pistons is one of thermal expansion. To solve this Archer and Kempf developed the 132 alloy, sometimes called "Lo-Ex." This alloy is the result of tests with many hundreds of compositions. It contains about 14 per cent silicon with varying amounts of nickel, magnesium and copper. A recent development at the Cleveland works of the Aluminum company is the use of 132 alloy as forged pistons as well as cast pistons. No. 132 alloy was put on the market about 1928. Considerable work on high-silicon piston alloys has been done in Germany.

New Heat-Treated Castings: Work carried on during the last few years by Archer and Kempf, culminating in a paper presented by them before the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, resulted in the development of alloys having superior casting properties to the 195 alloy and giving, after heat treatment, similar mechanical properties with better corrosion resistance and slightly lower specific gravity. They belong to the group of aluminum-silicon-magnesium alloys and may also contain small amounts of copper. Commercial examples are the Alcoa alloys, Nos. 355 and 356.

Alclad sheet was developed a few years ago by E. H. Dix, Jr., New Kensington, Pa. It consists of a core of high, strong alloy, such as duralumin, with surface layers of high-purity aluminum, work-welded and integral with a core. The aluminum protects the core from corrosion.



E. W. Rice, Jr.

THE BROADENING

By E. W. RICE, JR.

Honorary Chairman of the Board
General Electric Co.

ABOUT fifty-five years ago, in March, 1876, a President of the United States, Ulysses S. Grant, touched a telegraph key in Washington—a feeble current of electricity flashed to Philadelphia and set in motion the “giant” Corliss Engine, in Machinery Hall—one of the important buildings in the Centennial Exposition of 1876. I well remember the wonder, even awe, which was inspired by this mammoth engine, the giant power of those days.

This event seems to me to illustrate the great changes in our industrial life which have occurred in the brief time which has since elapsed. This Corliss Engine, which by the way developed only one thousand hp., represented the pinnacle of power in 1876. Yet today there are literally hundreds of power units, each one of which would equal the power of twenty such Corliss engines, while the mammoth power turbine of the present will do the work of 300 giants of 1876.

That feeble current of electricity sent over a telegraph wire to Philadelphia also serves to call to mind the condition of the electrical art at that time. The telegraph was by far the most important, in fact the only commercial application of electricity, to the service of man.

Brush, Thomson and Edison were just beginning to dream their dreams of a world lighted and pow-

ered by electricity. Alexander G. Bell had just invented the electric telephone.

I remember the thrill of my first sight of an electric light. It was at this same “Centennial” in 1876—the bluish, dazzling light was supplied with current from a machine invented by a Frenchman, Zenobe Theophile Gramme—the first practicable dynamo electric machine).

Strangely enough, and prophetically of the future, one of these same arc light dynamos of Gramme was also operated as an electric motor used to pump water. This was the first time that I have ever seen mechanical power as well as light produced by electricity coming from a dynamo electric machine.

These wonderful electrical exhibits were not the only sole representatives of the electric power and light industry in the exhibition, but, I believe, the sole representatives in the United States at that time. One could not call it an infant industry, it was scarcely embryonic.

At this same exposition Bell showed to a few scientific friends, among them the late Lord Kelvin, the electric speaking telephone—then nothing but an interesting scientific experiment, whose voice was eventually to travel around the world.

These events which I have briefly sketched occurred a little over fifty years ago; they made little impres-

sion upon the thousands of visitors to the world's first international exposition. Yet we now realize that they were the first rays of light announcing the dawn of the electrical era.

Neither telegraph nor telephone signified such an all-inclusive epoch in human affairs as did the arc lamp. They depended upon batteries as the source of their electric current, whereas the electric light was served by the dynamo or generator. Therein lay the great significance of this new departure; for the dynamo, with its vast potential capacity, made possible the production of electricity in large amounts to supply the innumerable needs of the people.

For a few years the arc light, the commercial introduction of which began late in the seventies, remained the only article of utility to be supplied by the dynamo. In 1882 it was joined by the incandescent lamp, which had just been commercially perfected after its invention by Edison in 1879. Both types of electrical illumination made use of the central station idea; but, as events proved, the seed of future expansion through this plan of operation was to be found in the incandescent lamp of Edison and not in the arc



FRONTIER OF ELECTRICAL DEVELOPMENT

lamps of Brush, Thomson and Wood.

The reason for this was logical enough. The incandescent lamp was an article of great popular convenience, small enough to be of service in the home and to illuminate moderate-size rooms in dwellings as well as stores, offices and similar places, in which the larger, more dazzling arc lamp was not acceptable.

If Edison had never done anything else than give us the incandescent lamp he would deserve our eternal gratitude. However, he did much more. He adapted to the needs of his system the parallel circuit idea, much improved by his ingenious three wire plan. He insisted, and correctly, that no other method would adequately solve the problem of the generation, distribution and utilization of electrical energy; and upon this method of electric-current distribution, no less than upon the convenient incandescent lamp, was founded the beginnings of electrical supply systems in cities and towns on every side.

About the middle of the decade

between 1880 and 1890 a few electric motors made their appearance. These were of either the Daft or Sprague type, shortly followed by the Thomson-Houston type. The earliest of these motors were of five, ten or fifteen horsepower capacity, and were employed for such modest tasks as driving sewing machines in commercial tailoring establishments, printing presses, ventilating fans, coffee grinders, jewelers' buffing machines, and here and there an elevator or lift. Meanwhile a more spectacular development had been gaining headway—the application of electric motors to traction. This reached its practical culmination just before 1890 in the work of Sprague at Richmond, Va., and of Van Depoele, through the Thomson-Houston Company, at Boston, where the great West End Street Railway system was completely electrified.

The arc lamp and incandescent lamp were the only devices for utilizing electric power during most of that early decade of 1880-1890. Afterward there followed that great expansion into the field of trans-

portation, during which horse cars were replaced by the electric trolley. Towns and cities were interconnected by electric interurban railway lines. Steam locomotives were replaced by electric locomotives in underground railways, at many terminals, on suburban lines, and for climbing mountain grades. Electricity has come into general use for the operation of mines, of factories, in stores, hotels and residences, and for every conceivable service.

And yet it almost seems that everything which has been accomplished in the past is trivial compared with what will be accomplished in the future. We are no less on the frontier than at the beginning. It is simply a broader frontier from which we are working out.

Perhaps oncoming generations will be so much more sophisticated than those of fifty years ago that the achieve-

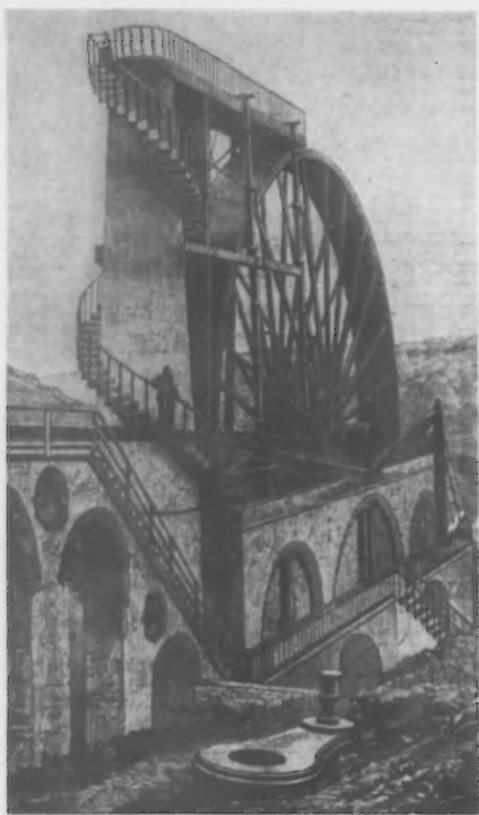


TODAY, life is enhanced electrically on every side. It seems hardly possible that the process could go further—and yet electrical development is still young; it is the most forward looking of all the material arts; it will continue to revolutionize life during coming years in ways beyond our imagination."

These are the prophetic words of the author of this article, who has lived with the electrical industry since the coming of the first electric motor, and whose work as an engineer and executive in that industry has been a large factor in its remarkable progress.

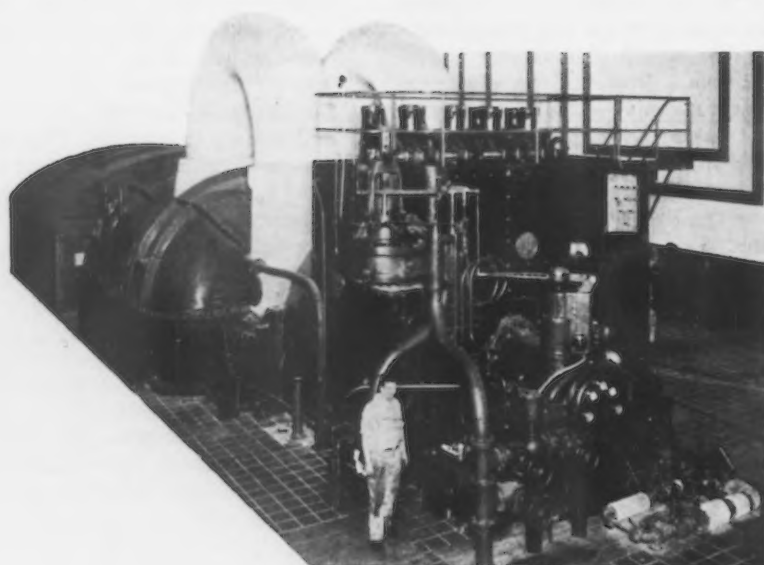
During the past half century, the coming of electricity into industry has been, without doubt, one of the chief accelerators of industrial progress. Its work has been done so naturally and gradually that we do not realize what it has meant. But let electricity be suddenly removed from the world and industry would become paralyzed.

That those who are most conversant with its possibilities believe that electricity's greatest accomplishments are to come is an encouraging thought when we realize its close relation to industrial progress as a whole.



MORE POWER— LESS SPACE

ABOVE is the "Great Laxey Water Wheel" of 1854, of 200 horse-power, and at its right is the "Great Corliss Engine" of 1000 horse-power, of 1876. Contrast them with the 200,000 horse-power present day turbine at the East River Station of the New York Edison Co.



ments which accompany future electrical progress will not particularly surprise them. But when electric lights first appeared, soon followed by electric street cars, the amazement of the people was almost endless. It seemed marvelous to be able to light a room by turning a little switch many feet distant from the electric lamps, and to extinguish the lights by the same simple method. Moreover, folks stood staring at street cars that moved along without horses to pull them. This, of course, was almost ten years before the first crude automobiles.

Naturally the electric street car had to meet and overcome many technical difficulties before reliable elec-

trical propulsion was a reality. In the same manner the electric light felt its way along. Edison devoted several years to improving the incandescent lamp before he began to operate his first historic central station system at 257 Pearl Street, New York; and it is said that for a few months the customers whose premises were connected to the system received their current free. Edison's company sent out no bills until a period of test had assured the great inventor that there were no faults in the operation of the system under commercial conditions.

In the power field the electrical idea gained remarkable headway once its value had been demon-

strated. The electric motor rapidly took the place of locally generated steam power and of the small oil and gasoline engines. The electric wire replaced the belt, and finally the individual motor-driven tool came into almost universal service. And now electric heating is proving its worth and economy. First came the electric soldering iron and glue-pot, followed by furnaces for handling steel, copper, brass, glass; ovens for enamel and japan varnish; and, most recently of all, the electric welding machine, replacing the ear-splitting riveting process.

The general pace was quickened, in the early nineties, by the commercial establishment of the Stanley trans-

former and the Bradley rotary converter, as well as by the general promotion of alternating-current practice (made possible by the transformer) by Westinghouse and Thomson, and the later technical achievements in this field of Steinmetz and Tesla. Again, between 1900 and 1910, there came a tremendous speeding up of electrical development through the steam turbine, exemplified in the Parsons and Curtis types.

In my opinion, the most important single material contribution to the enormous expansion of the electric power industry has been the creation of mammoth steam-turbine units. The steam turbine's unique position in the industry has not been so dependent upon its thermal efficiency as upon its low capital cost, its reliability and simplicity, and, most important of all, because of the fact that an enormous amount of power can be concentrated in one unit. It represents the mass production idea as it is applied to the

business of manufacturing power.

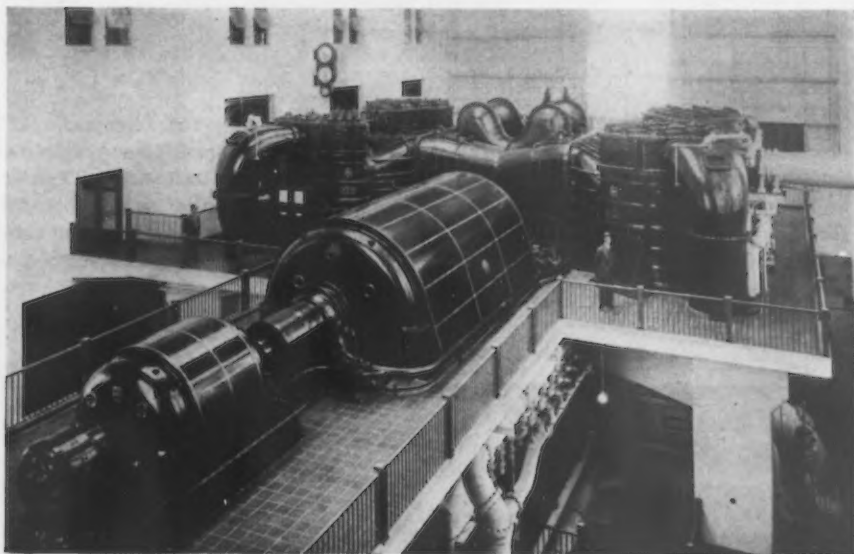
And now fifty years have passed since the electrical art, in the practical, everyday business sense, came into the world as an infant among the material achievements of man. It has grown into a marvelous youngster with a wondrous future before it. It is still young, especially as compared with other human arts; yet it so nearly dominates our material life today that if electricity were suddenly removed from the world society would be paralyzed and human affairs would become chaotic.

Our twentieth century civilization depends upon electricity about as much as man's physical life depends upon oxygen. This is illustrated by the influence of electric power upon modern industry.

Calculations based upon the Government census of manufactures reveal that each industrial worker now has an average of four and one-half horsepower at his disposal. This power is largely electrical; it

is convenient, reliable, flexible and easily controlled. Naturally it increases the individual man's capacity for production many fold, until it is asserted that our American workman is now the most productive industrial employee in the world.

But there is a still greater significance to this situation. Seventy-five years ago, when the average amount of power available for each industrial worker was scarcely more than one-half of one horsepower, the man himself constantly contributed the energy of his own muscles. He performed a certain indispensable amount of physical labor in the factory. With the increase of electric power in industry there has occurred a corresponding decrease in the use of muscle power, until today the highly skilled machine-tool operator, to mention but one class of worker, is a director of power, controlling energy with a minimum of physical exertion, and working with his brain far more than with his



HALF century evolution in central stations. In the early '80's, people flocked to see the "last word" in electric power production represented by the Boston arc-light central station with its Thomson dynamos. But it will be a long time before the "last word" is said in electrical improvement, even with such remarkable generating plants as this one of the Southern California Edison Co.

THE old Boston central station, at the right, must have been a perilous place in which to work, judging by the horizontal driving belts shown in this picture. Note also the wiring running along the walls, and the arc-lights for illumination.





AT the left is a modern electrical switchboard, with its recording instruments and control apparatus—almost an electrical brain, controlling the activities of a huge rolling mill.

hands. This has largely transformed the economic and social status of the factory workman.

No less revolutionary has been electricity's effect upon industry. The industrial progress of America is bound up in the electrification of her factories; and Henry Ford has made the striking statement that as a nation we have advanced along material lines because of the inventions of Thomas A. Edison. Electricity in industry has made mass production possible, with all its attendant advantages in supplying twentieth-century markets.

Just how has it done this? It has done it, first of all, by creating adequate, convenient, easily controlled illumination, so that three shifts per twenty-four hours could be operated when desired, and the archaic regulation of factory schedules on sun time, in order to utilize every moment of daylight, was no longer necessary. It has eliminated the maze of belting and shafting which in the factories of half a century ago, occupied practically every square foot of overhead space. The removal of belts and shafts made possible the introduction of that great factor of modern efficiency, the electrically driven carrier system. As a result man now stands still while the work moves past him.

It has facilitated the development of huge machine tools, which, through the motor drive, demand and receive more energy than could be supplied by belts and shafts. It

WHO can remember when the last word in switchboard design was this crude affair of plugs, cords and sockets?



has permitted efficient groupings of machines according to production cycles, the ready expansion of shops, and the economical utilization of factory space. It has made possible, the modern system of handling materials with cars and barges

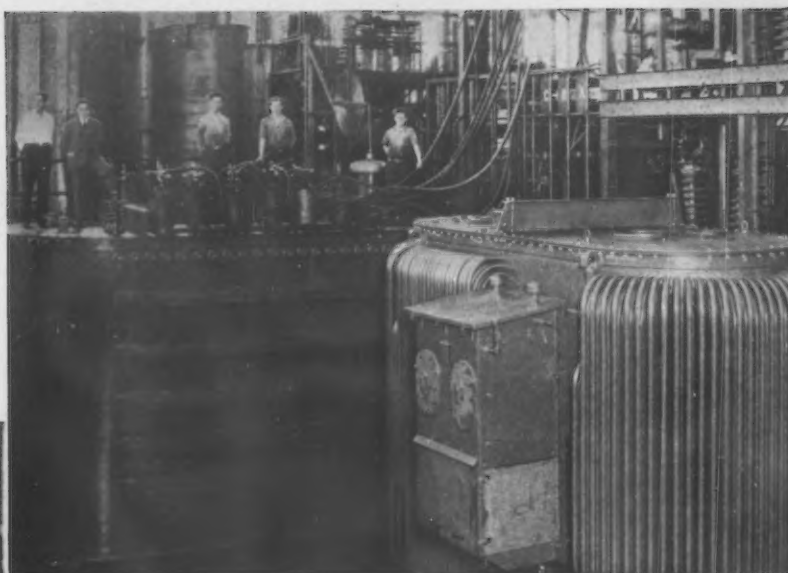
unloaded by giant electric yard cranes. These are often combined with enormous elevating mechanisms, which make it possible for materials to be moved from one place to another and also to be raised to unloading levels.



THE factory interior of thirty or forty years ago, an example of confusion overhead and underfoot.



TRANSFORMATION and transmission of electrical current have kept pace with the evolution of its production. The modern transformer, as shown at the right, is an impressive example of electrical engineering progress.



HERE is the original transformer, built by William Stanley in 1885. Could he have foreseen its tremendous growth?

During this stretch of years the size of the individual electric generating units in power stations has constantly increased with a corresponding increase in the size of the power station itself. The increase in voltage which followed naturally

has made possible the transmission of electricity over large areas with small loss. All of these factors, guided by intelligent management, have brought about a great reduction in the cost of electric power to the ultimate consumer. This is

unique as a general increase in the cost of other services has in general taken place.

During the past twenty-five years electric power stations have been interconnected by electric lines—not only the stations under common ownership, but those under different control. As a result large sections of the country are gridironed with electric lines, carrying cheap energy to every small settlement, to the rural communities and to the farms.

And what of the effect of electricity upon life in general? It has long since done away with oil lamps and gas burners in urban homes. It has lightened a long list of household tasks, has taken over the refrigeration and the cooking of foods, and stands ready to heat and cool interiors, large or small. It has begun to enter into farm life, where it is the ideal hired man, the housewife's helper, the teacher, entertainer and medium of culture.

In the metropolitan centers it has made possible the towering skyscraper which is unthinkable without the electric elevator and the incandescent lamp. It has become indispensable to the automobile through ignition and starting mechanisms, as well as lights. It has contributed to the supplying of lights and the starting mechanism of the airplane, and has made the motion picture, both silent and talking, what it is today.

It has brought about a new day



THE coming of the electric motor has revolutionized the appearance of our factories as well as their efficiency.

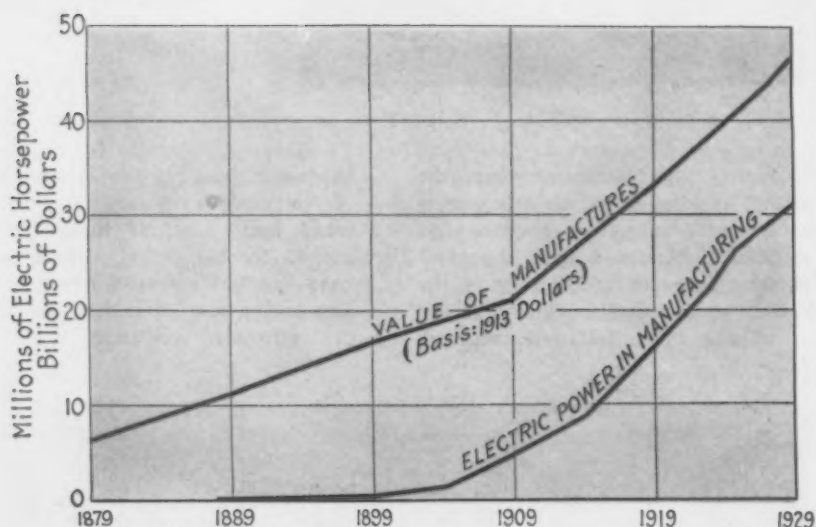




MASCULINITY characterized the early telephone exchange. (Above)

At Right—Advent of electrical power in industry served as a marked stimulus to American productivity.

Below—Shadowless electrical daylight, electrical materials handling and individual motor drive—a triple-play in modern industry.



in transportation through urban rapid-transit systems, and it has given railroad and marine transportation an efficiency and cleanliness never previously approached. Railroads depend upon it for their signaling systems. It has contributed the modern X-ray tube to dentistry and medical science; it lies at the heart of radio and television; and in the new technique of the vacuum tube it foreshadows remarkable accomplishments in the not distant future.

Today life is enhanced electrically on every side. It seems hardly possible that the process could go further—and yet electrical development is still young; it is the most for-

ward-looking of all the material arts; it will continue to revolutionize life during coming years in ways beyond our imagination.

SOME three years ago a working electroplater in London discovered a process by which a white metal having tin as its principal ingredient might be deposited by electricity on iron and steel as well as upon copper and brass. Most of our readers know that to plate steel and iron with silver has hitherto been deemed impossible without the intervention of copper as a coating; and the process of tinning thin sheets of iron so as to make them tin plate is a familiar one, but to cover any metal with tin by the use of the galvanic bath is new. This invention is now in practical operation in Victoria Street, Birmingham.

Extract from The Iron Age, Aug. 20, 1873.





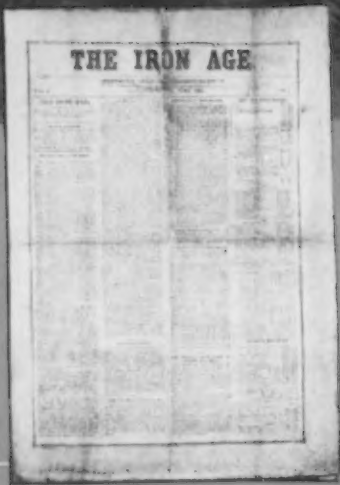
...1855...

✦ Hard labor through long hours, backs bent and muscles strained in carrying industrial burdens, the world of work in 1855 would be characterized today as an age of human slavery. Power invention awaited the coming of a material through which they could effectively work their wonders. It was steel. The coming of the Bessemer process put this hitherto scarce by this to grow the end constr the to human



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 ng of the Bessemer process 5 put this hitherto

scarce master-metal within the grasp of man. Nourished
 by this powerful food, infant American industry began
 to grow strong. Through its use have been worked
 the ensuing wonders in production, transportation and
 construction. The flames of this first converter symbolized
 the torch of progress and forecast the liberation of
 human effort from the chains of physical drudgery.



LONG TERM STEEL BAROMETER POINTS UPWARD

By SIDNEY G. KOON and C. E. WRIGHT

THE period of 75 years which this Anniversary Number of The Iron Age celebrates measures the entire span of the American Steel Industry. Since 1855, the industry and the demands for its products have grown steadily, until, today, steel is accepted as the major barometer of business activity.

Depressions, such as the present and those preceding it, may have caused temporary reversals of the forward movement, but over the long term steel has moved onward and upward in production and demand. Consumption, per capita, in the United States, is six times that of iron in 1855, and the total consumption during the past seventy-five years has been multiplied by thirty. In spite of this marked increase, the per capita trend is still upward.



STEEL has been one of the most important barometers of the country's industrial growth during the last half-century. Having now attained what may be assumed to be the major part of its development, the rate of increase henceforth may be at a less accelerated pace. Yet, in the light of the amazing era in which we live, the record of 10 or 20 years from now might prove that this conservatism is wholly unwarranted, considering the steel trade history of the past several decades.

In appraising the probable growth of steel uses in the future, it must be recognized that at the moment there appears to be no prospect of a single new line of consumption which will exert the marked influence upon the development of steel manufacture that the automobile industry has wrought in the past quarter-century.

Rather, it seems probable that the expansion of steel volume will depend on a hundred and one different new and increasing uses. Substitution of steel for other materials seems to offer the most likely source of larger consumption. We have many examples of such substitution

today, and there will undoubtedly be many additions in the years ahead. The average individual was scarcely conscious of steel 20 or 25 years ago, except as he saw it on the railroads or in buildings or bridges. Today it is in every home and in every office, and such uses, extending into the thousands, are on the increase.

Consumption Per Person Six Times That of 1855

When THE IRON AGE began its service to the metal-working industries the United States was consuming about 117 lb. of iron per head each year. Steel was almost absent—perhaps 1 lb. for each person. Great Britain at that time was using about 144 lb. of iron per capita. The present finished iron and steel consumption in the United States, with a population four and a half times that of 1855, is approximately 700 lb. to the person. Wrought iron is about 1½ per cent of the total. In Great Britain the figure is possibly 600 lb. Consumption per head in the United States is six times what it was three-quarters of a century ago, and the total consumption has been multiplied by thirty.

From an early and modest beginning the United States increased rapidly in importance as a center for the manufacture of iron and steel. This growth was due in part to a steadily and rapidly growing population. It was due in part to the large introduction of labor-saving machinery, in part to the grand scale on which the industry has been carried on for many years and, of course, in large measure to the discovery of the cheap and rich ores of the Mesabi region.

But the distance of 1000 miles, separating the ore fields from the cheap coals of western Pennsylvania, would have been a severe handicap were it not for the fact that a remarkable cheapening in transportation, brought about by the very group of men who were developing the iron industry, made it possible to bring the two raw materials together into the place where the smelting would occur.

About one-tenth of the world's pig iron was made by the United States in 1855. For many years the growth of the iron industry in this country was so much more rapid than that in the rest of the world that our proportion grew steadily—to 14 per

INGOTS AND CASTINGS GROSS TONS

Decade	Production	Increase	Increase Per Year
1871-1880	5,037,884		
1881-1890	24,725,157	19,687,273	358,000
1891-1900	65,578,371	40,853,214	743,000
1901-1910	187,673,574	122,095,203	2,220,000
1911-1920	350,993,236	163,319,662	2,970,000
1921-1930	427,100,000	76,106,764	1,385,000

cent in 1870, 21 per cent in 1880, 35 per cent in 1900, 43 per cent in 1907 and approximately the same ratio during the last few years. The output of the United States increased about seven-fold in the quarter-century between 1880 and 1907 against an increase of five-fold for Germany and Luxemburg, a gain of only 28 per cent by Great Britain and something better than a trebling by the world as a whole.

In steel the increase was still more rapid. During the same 27 years the United States output multiplied by 19, whereas British output multiplied by only five. Our proportion of the world's total, which was only 3 per cent in 1865—10 years after our review starts—had reached 46 per cent in 1907 and in two or three of the years immediately past has been more than one-half.

As the era covered by THE IRON AGE opened, the iron and steel industry in this country was dominated by wrought iron. More than 98 per cent of the combined wrought iron and steel tonnage produced here in 1865 was wrought iron. Not until well along in the 1880's did steel overtake wrought iron as a material of construction. It represented only 37 per cent of the total in 1880, but grew to 85 per cent during the next two decades, to 91 per cent in 1907 and to 98.8 per cent in 1929. During the 75 years, steel and wrought iron have completely changed places, with a very minor fraction of steel used at the beginning of the period and a minor fraction of wrought iron at the end.

Capacity Keeps Pace With Demand

In 1874, with the country suffering from an industrial depression, the question of overproduction of manufacturing capacity was being raised. At that time THE IRON AGE said:

"It is perhaps unnecessary to discuss the question of surplus productive capacity. Until the advocates of this theory shall be able to support in their arguments the actual consuming requirements of the country, their doctrine falls to the ground for want of anything to base

it on. An abnormal condition of affairs, which suddenly cuts off the demand for a given product, and which is prolonged by a feeling of uncertainty in monetary circles, is not to be considered as an evidence of excessive productive capacity."

By providing the facilities before they apparently were needed the steel industry has led the way in the development of new and increasing uses for steel. Forty-six years ago James M. Swank, in his book, "Iron in All Ages," referred to the "astounding progress" that the iron and steel industries of the United States had made in the preceding 20 years. And in 1884, when this observation was made, only 1,550,879 gross tons of steel ingots was produced in the entire country—not much more than a week's work for the steel capacity of today.

Since Mr. Swank's time the rate of progress has been more "astounding" than possibly he ever dreamed of. Although he lived until 1914, the largest annual output of ingots and castings within his lifetime was only a little more than half of the total of 1929. What this brief space of 15 years has brought in steel production increase offers food for thought as to the future.

Shape of Trend Line in Next Decade

Will the rate of progress in the next 10 or 20 years equal that of the past decade or two, or may we expect a flattening out of the trend line, which has been steadily upward, omitting depressions and off years, since the Bessemer steel-making process was introduced in 1855, the year THE IRON AGE was established?

Economic historians of the future may look back upon the 75 years encompassed by the existence of THE IRON AGE as the period of greatest steel development, or it may be that we are now merely setting out upon another era of greater progress.

Statistical probabilities point to a continued gain. Whether the rate will be accelerated or lessened depends of course on some factors unknown to us now, just as the automobile was unknown to those who

might have tried to look ahead, say in 1890, when the steel industry began making its most rapid strides, following a period of comparatively slow development.

We know, however, of certain trends which have appeared in recent years, and which are almost certain to become more marked in the near future. Our records point to amazing growth in the use of structural steel and concrete reinforcing bars for building construction, also in the use of the lighter forms of steel—sheets and strips—for countless purposes scarcely thought of a decade or two ago. Population increase alone accounts for a yearly growth in the use of tin plate for food packing and other services.

Comparatively new uses for steel, such as for furniture, for public highways, for dwellings, for flooring in factories, warehouses and garages, are of too recent development to make possible any attempt at guessing how far these known consuming channels may progress, not to mention the probability of many uses still to be promoted.

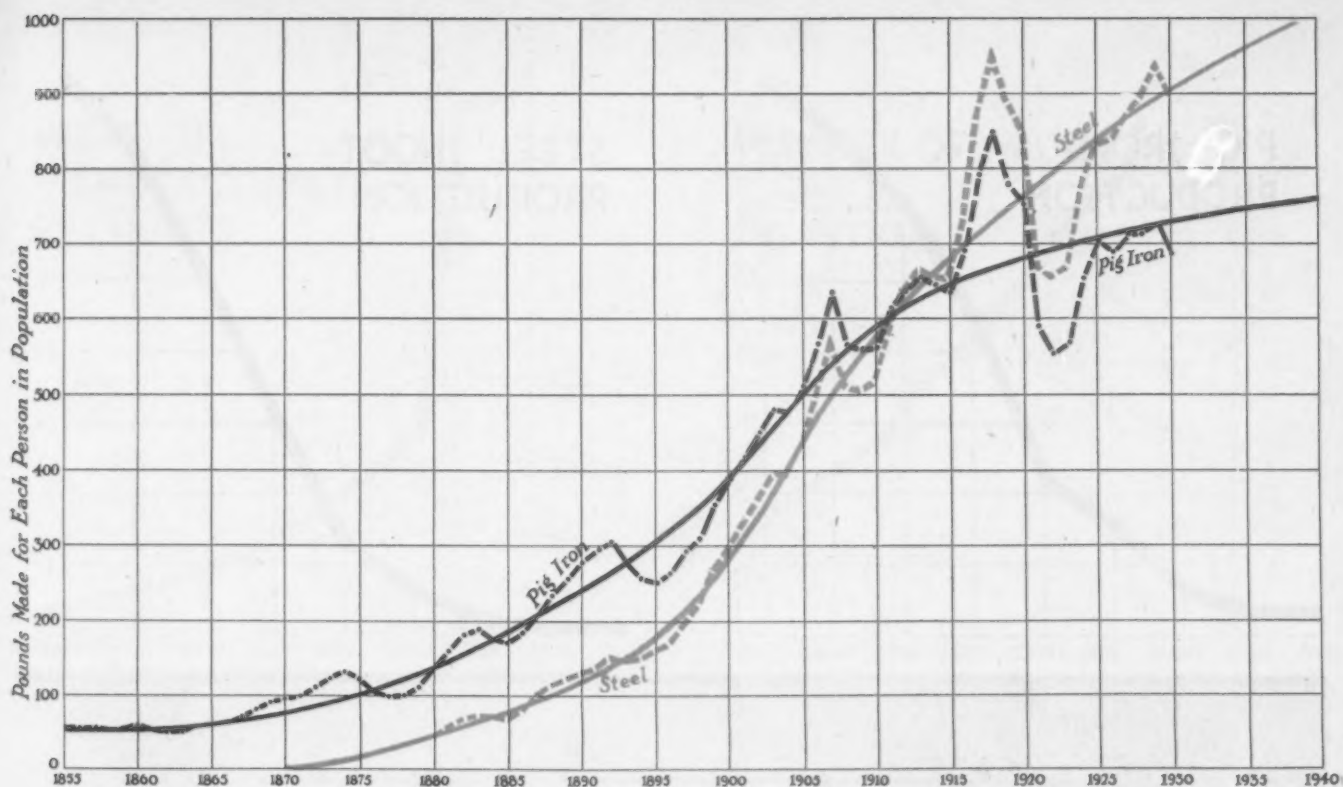
What Forms of Steel Show Best Gains

We know that only a few of the various forms in which steel is manufactured have failed to make gains. Rails had their best year in 1906, with almost 4,000,000 tons, and have not done so well since, 3,000,000 tons now being considered a good annual tonnage, and often the total falls below that. Wire products, as shown by the annual tonnage of wire rods, are barely holding their own, while wire nails have shown something like a 20 per cent decline in the past decade.

These losses, however, have been more than made up by substantial gains in other products. Structural

STEEL PRODUCTION FOR EACH PERSON IN POPULATION

	Year's Total, Pounds	Trend of Con- sumption, Pounds
1915	725	680
1916	951	700
1917	988	718
1918	961	735
1919	739	750
1920	887	765
1921	411	780
1922	726	795
1923	901	809
1924	747	824
1925	881	839
1926	924	853
1927	849	867
1928	962	880
1929	1,041	894
1930	739	907
1931	...	919
1932	...	931
1933	...	943
1934	...	954
1935	...	965



AMERICAN PRODUCTION OF IRON AND STEEL

Production of pig iron in the United States has increased from 50 or 60 lb. per inhabitant in the decade 1855 to 1865 to about 725 lb. in the last half-dozen years. As shown by the curve, based on plotting three-year moving averages, the production of the next few years, on the basis of past history, should run at the rate of about 750 lb. per person, or 40 to 45 million tons a year.

Steel history is not so long, as we made less than 70,000 tons in 1870, or about 4 lb. for each person. The growth has been much more rapid, however, steel production passing pig iron production about 1912. On the same basis, a maximum was reached in 1918, and again in 1929, both at about 950 lb. However, the normal curve has not yet reached these figures. The apparent prospect, based on past history, indicates that during the next few years we shall be consuming something like 950 lb. for each person, or 55,000,000 tons a year. In only one past year—1929—have we reached such a high figure.

shapes have gained lately in production at an average annual rate of $5\frac{1}{2}$ per cent, or about 225,000 tons a year. Meanwhile, the use of fabricated structural steel for buildings, as shown by the records of the Department of Commerce, has more than doubled, taking as a comparison 1920 and 1929, both good years.

During the same period all classes of steel bars gained almost 11 per cent, concrete reinforcing bars gained more than 66 per cent; tin plate, more than 36 per cent; plates and sheets together, plus 33 per cent, while strip steel, showing the most remarkable growth, doubled itself in five years, and in 1929 was more than 10 times the total for 1921, the earliest year for which figures are available.

These facts are sufficient to establish the trends of increase that have been developing in some of the more important steel products. Taking the figures for all steel production, each decade since 1880 has brought a large increase. It is worthy of note

that the lowest yearly output of ingots and castings in any decade was virtually equal to the highest of the previous decade. The one exception was in the depression year, 1921, when the 19,783,797 tons produced was below any yearly total of the preceding 10-year period.

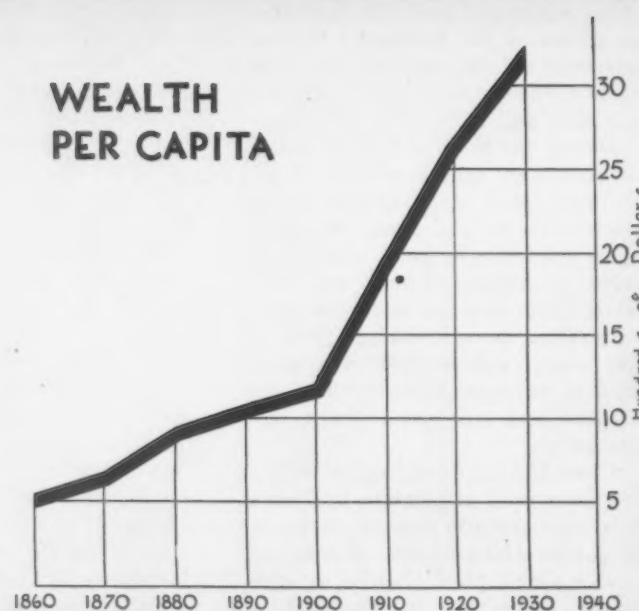
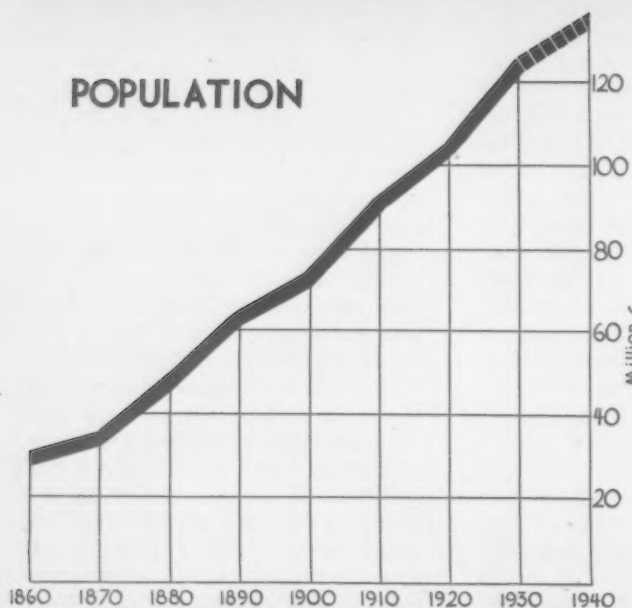
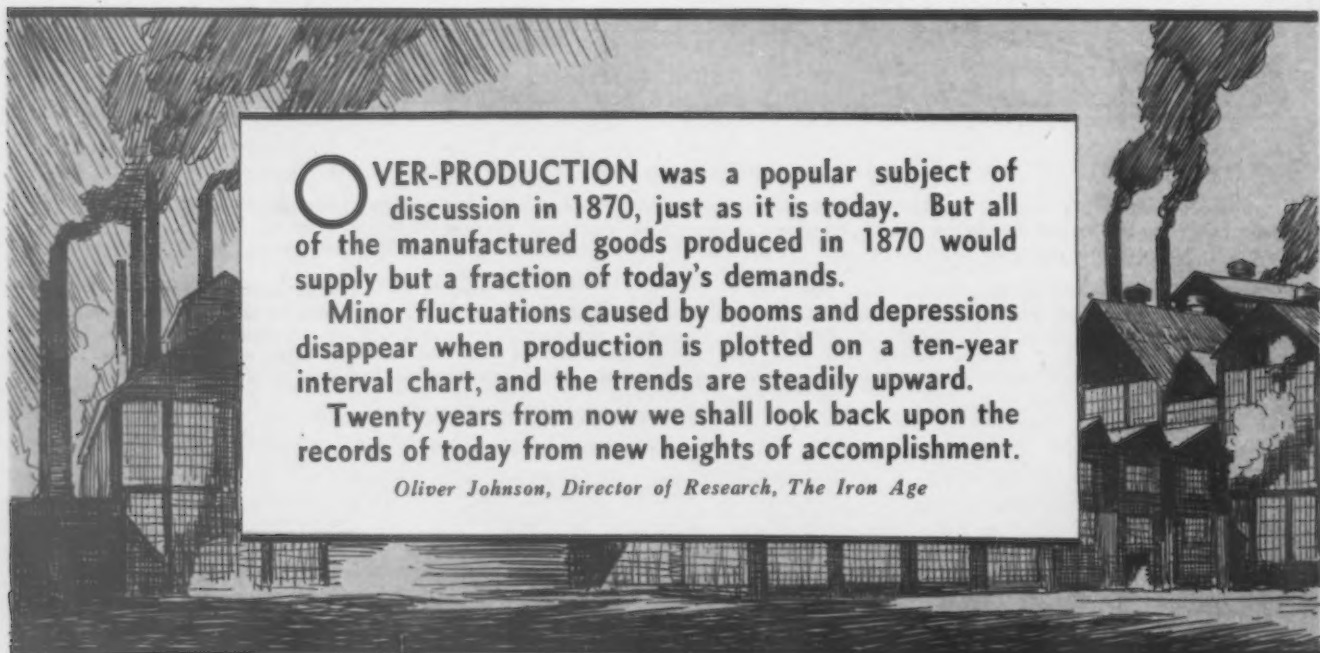
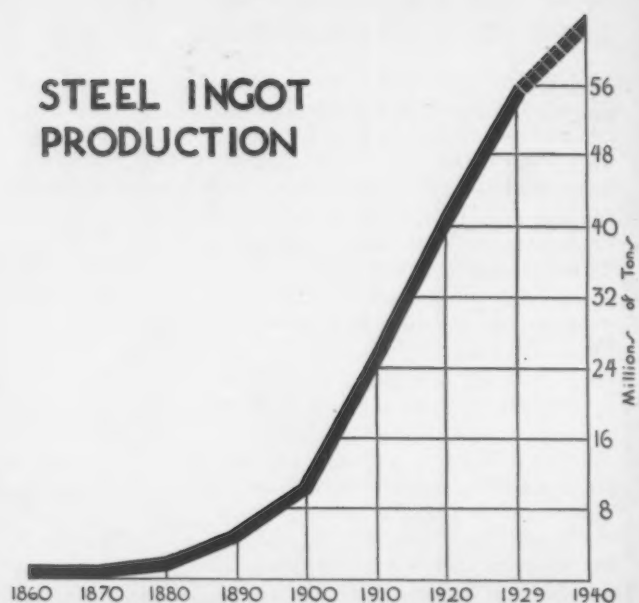
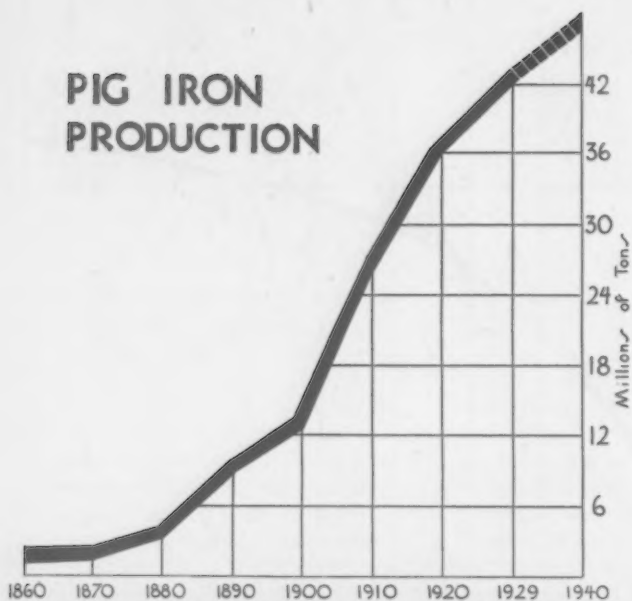
Aggregate tonnage produced in ten-year periods tells a story of growth. The table gives the figures for steel ingots and castings combined. The fifth decade listed includes the abnormal war demand, making an annual increase for that decade, considered alone, of nearly 3,000,000 tons, as shown. The decade just coming to a close will make the large total of 427,000,000 tons, which, compared with the preceding decade, indicates an annual increase of 1,385,000 tons.

The period of largest gain, which included the war years, was also the time when the automobile industry became a substantial user of steel, although the volume development in automobile production did not come

until we were well into the past decade. The period of greatest railroad expansion was from 1880 to 1890. In 1887 the railroads of the country laid 12,876 miles of new track, and the total rail consumption that year was 2,276,921 tons, which was not equaled until many years later.

Gains in consumption of metals by the industries of the United States are not confined to steel. The aluminum production of the country has shown the sharpest increase, recording a gain of about 57 per cent for the 10-year period ended with 1929, as compared with the total for the preceding decade. During this same period the output of primary copper increased more than 25 per cent over that of the previous decade, while the steel increase was just over 27 per cent.

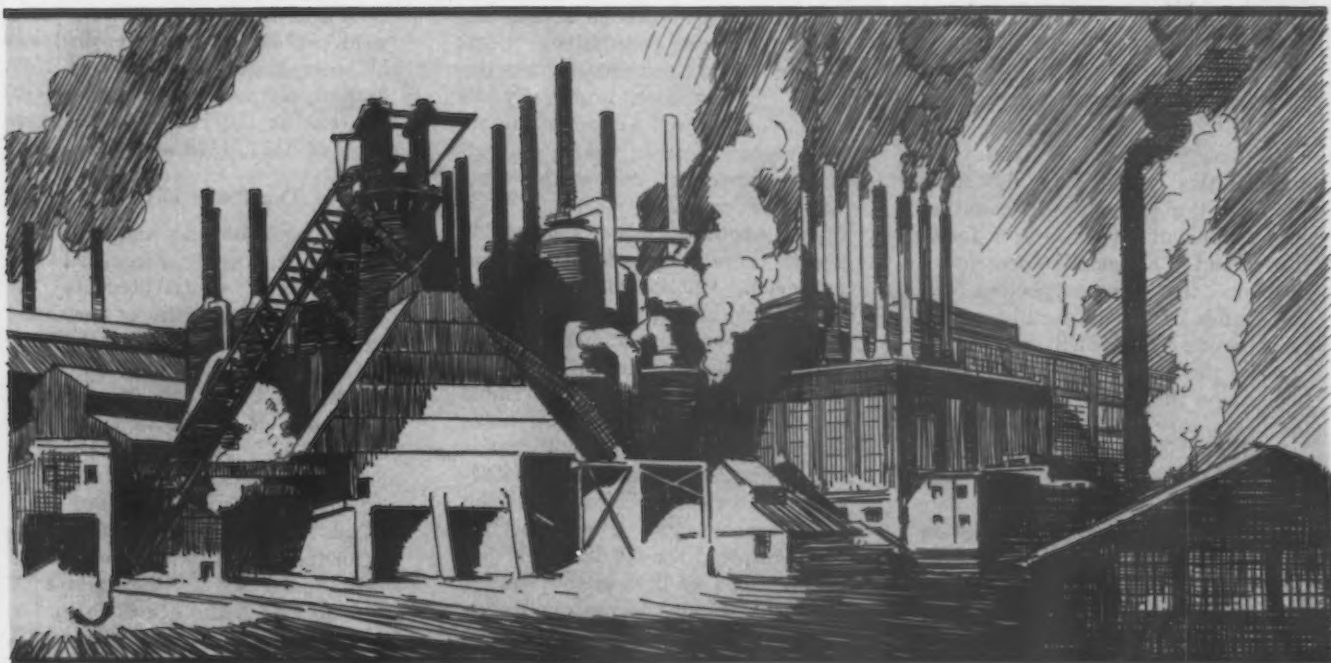
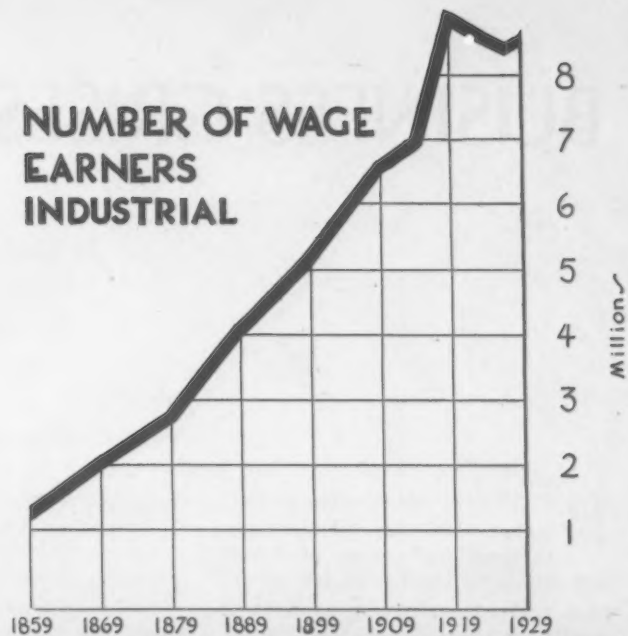
Despite a certain amount of replacement of one material by another, the substantial gains being made in these three important lines point rather conclusively to a continued upward trend for them all.



**VALUE OF
MANUFACTURED
PRODUCTS**



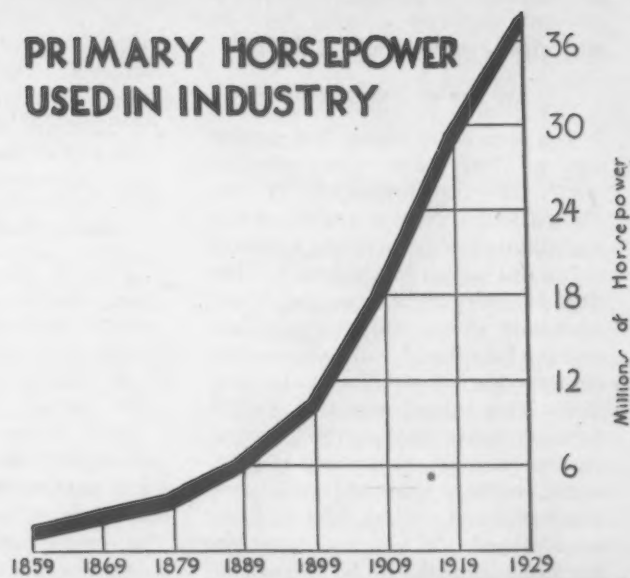
**NUMBER OF WAGE
EARNERS
INDUSTRIAL**



**INDUSTRY'S WAGE
PAYROLL**



**PRIMARY HORSEPOWER
USED IN INDUSTRY**



BUSINESS CRISES OF PAST 75 YEARS

By GILBERT L. LACHER

BUSINESS depression induces sober thinking; it stimulates a searching survey of causes and effects, a critical review of the past and a penetrating analysis of conditions governing the future. Everywhere the question of the day is: "Where are we going—where will the forces that brought on the current reaction finally lead us?"

No easy answer is at hand. The complexities of modern industrial life and the interplay of countless interdependent economic forces throughout the world present a problem that is perplexing the best minds of our day. But out of their earnest study will undoubtedly come the revelation of new truths to illumine the course of business in the years ahead.

Well aware of the magnitude of the inquiry and making no pretensions of capacity to make a complete appraisal of the current depression or an accurate forecast of industry's future, the writer will confine himself to a review of past business cycles, in relation to changing phases of our economic development, and an estimate of the significance of present problems as seen with an historical perspective.

An Era of Exploitation

The span of 75 years—the present age of THE IRON AGE—coincides with the transformation of the United States from a predominantly agricultural country to the foremost industrial nation in the world. The first 50 years were a period of exploitation of our natural resources, and the building of railroads and the construction of equipment to promote that development. Fertile farming lands were settled, virgin forests were cut, rich mines of gold, silver, copper, iron and coal were discovered and worked, vast oil fields were tapped. It was an era of remarkable growth in both agriculture and industry.

Following the passage of the Homestead Act in 1862, free Western lands attracted millions of immigrants to our shores. A protective tariff stimulated the expansion of manufacturing, the products of which found a market in the rapidly increasing farm population. Until the end of the 19th century the domestic market took practically all of the output of American plants and mines. In other words, agriculture expanded at nearly the same rate as industry.

Throughout this era of spectacular growth there was always some unrest among the laboring and agricultural populations, but it took the form of sporadic outbursts rather than sustained pressure. The social structure was fluid—the mechanic of today became the farmer or manufacturer of tomorrow. Dissatisfaction with real or supposed maladjustments was therefore, on the whole, transitory. The industrial workman could always leave his job and take up free land in the West—a fact that tended to sustain wages and to promote the development of labor-saving machinery. The farmer, after exhausting the soil of its richness in one location, could always move farther West and repeat the process. The conditions of the time fostered a spirit of pronounced individualism and resourceful enterprise that was out of keeping with class consciousness.

Cheap Money Causes Inflation

Yet in one respect the farming and laboring class did exert a profound influence on the course of business and that was in relation to our monetary system. Long before the period under discussion the debtor classes had demanded cheap money. Inflation led to rising prices and enabled them to discharge their debts in terms of a smaller amount of production; on the other hand, deflation, with declining prices, forced them to pay their creditors

more, in terms of goods, than the debts represented when they were assumed.

It was pressure of the debtor classes that brought the downfall of the second United States bank in the Jackson administration. The "wild cat" banking that ensued was the basic cause of the panic of 1837. Similarly an unstable monetary system was at the root of the severe crises of 1857, 1873 and 1893.

The Panic of 1857

Bank note inflation and a flood of gold from the newly discovered California mines contributed to the excessive stimulation of business activity that preceded the cataclysm of 1857. The issue of bank notes between 1843 and the panic year had expanded from \$58,000,000 to \$214,000,000. There had been an abnormal growth of trade on a credit basis and speculation had been widespread. The stresses and maladjustments set up in the commercial world finally led to the failure of the Ohio Life Insurance & Trust Co. in August, 1857, following which there was a long train of business disasters, including bankruptcies of the Illinois Central, the Michigan Central and other railroads. Business insolvencies during 1857 and 1858 numbered more than 9000, with losses aggregating nearly \$400,000,000. But recovery came within two years, when the country was on the brink of the Civil War.

Greenback Inflation and the Crisis of 1873

During that conflict Congress passed the National Banking Act, which definitely put an end to the issuance of notes by State banks. However, the gigantic expenses of carrying on the war forced the Government itself to issue notes unsupported by specie. Hundreds of millions of such bills, known as "greenbacks," were put into circulation. High prices resulted and en-

S AND WHAT THEY REVEAL

THE era of exploitation of natural resources is past.

The period of intensive cultivation of consumption has been entered.

The supposedly magic formula of making more and more goods with fewer and fewer employees has shown its limitations.

Economies in manufacturing must be found that do not hinge on increased output.

New products must be developed to provide work for the technologically unemployed.

The achievement of both of these ends will be accelerated by technical and market research.

terprise and production were stimulated. The opening up of the public domain to settlers by the Homestead Act and lavish Government land grants and bond issues to finance railroad construction to the Pacific Coast further raised the tempo of business activity. When, finally, in September, 1873, a panic was brought on by the failure of the great financial house of Jay Cooke & Co., THE IRON AGE editorially put its finger on one of the principal reasons for the crisis, saying: "Primarily the cause of the panic is found in the unwise policy of the Government in unduly stimulating railroad operations by large grants of public lands."

Business did not revive until nearly six years later and the stimulus was supplied by the railroads. On June 19, 1879, THE IRON AGE commented on the "indications of returning prosperity" as follows:

"Our rail mills, both iron and steel, are full of orders, and some that have been idle for years are preparing to start, or have already done so. Mills working on track bolts, splice bars, lock nuts and the multitude of other things that enter into the construction of road bed and rolling stock are full of orders. Car works that have not run full

since the panic are now working overtime."

The Panic of 1884

The revival was short-lived and in 1881 business commenced to round off. In 1884 a sharp break in the grain market, resulting in the failure of several grain brokerage houses, was followed by the collapse of the Marine Bank and the stock brokerage firm of Grant & Ward. A number of railroads also went into receivership, indicating that the lesson of 1873 had not been thoroughly learned. In referring to the failure of the Wabash, St. Louis & Pacific, THE IRON AGE of June 5, 1884, said:

"This railroad is a conspicuous example of the modern policy of grouping together short roads of no special importance, and uniting them in a 'system' of great pretensions without really adding to their earning powers, but as an inevitable consequence making the consolidation carry a new load of stock and bonds."

The Silver Issue Brings Complications

While the panic of 1884 was not so severe as that of 1873, the recovery that followed it failed to carry business to a high pitch of activity.

The general trend of prices continued downward and factors that had contributed to that tendency were the demonetization of silver in 1873 and the resumption of specie payments on the greenbacks in 1879. The agricultural sections of the West and South had protested vigorously against the contraction of currency and succeeded in forcing the enactment of two compromise measures in Congress—the Bland-Allison Act of 1878, authorizing the purchase by the Secretary of the Treasury of \$2,000,000 to \$4,000,000 worth of silver bullion monthly for coinage into silver dollars of full legal tender, and the Sherman law of 1890.

Sherman Silver Act Brings Crisis in 1893

Under the latter act 4,500,000 oz. of silver was purchased monthly by the Secretary of the Treasury at the market price and stored. Notes were issued in payment for it and were redeemable in coin. Since the law declared that it should be the policy of the Government to maintain the value of gold and silver coins at parity, the act had the effect of draining the Treasury of yellow metal. The Government chose to redeem the notes in gold, when requested, for fear that redemption in silver (the

silver dollar being intrinsically worth only 67c. in 1892) would destroy confidence in the willingness of the United States to pay its obligations in gold and would thereby cause that metal to command a premium.

Since the notes, when redeemed, were reissued, gold continued to be drawn out of the Treasury and was hoarded by both banks and individuals. At length a panic ensued, and, although a special session of Congress repealed the silver purchase clause of the Sherman Act in the fall of 1893, that action did not bring recovery. The depression was of unusual severity and lasted for four years, if exception be made for an abortive revival in 1895. The toll of the panic was heavy—there were widespread failures, much unemployment and pronounced industrial unrest.

But the agrarian insistence on cheap money did not relax and "free silver" became the main issue of the Presidential campaign of 1896. The defeat of Bryan, as well as a rapid rise in world gold production, laid this issue to rest and insured the permanence of the gold standard.

Expansion in Gold Output Causes Price Rise

Although the country was now safely on a "sound money" basis, the rapid expansion in gold output had the same effect on prices that it had had following the famed rush to California in 1849. New gold fields were opened up in South Africa, Canada, Alaska and Colorado and annual production mounted from an average of 7,883,000 oz. in the years 1891 to 1895 to 12,447,000 oz. in 1896 to 1900, steadily increasing in succeeding years until it reached 19,367,000 oz. in 1906, the year before the next severe American panic. While it cannot be said that this enormous growth in gold supply was a direct cause of the crisis, it furnished the basis for the rising tide of prices. The panic was inaugurated in March by the failure of the Knickerbocker Trust Co. in New York, which led to other insolvencies, although not on the extensive scale of 1893. The period of depression lasted for only one and one-half years.

World Money Market Strained

In analyzing the causes of the panic THE IRON AGE said editorially: "For fully a year and a half the strained condition of the world's money market has been discussed. Russian and Japanese demands were the menace to begin with; then it was world prosperity, and in the United States attention has been

concentrated on the dangers of a heavy speculative demand for money accompanying the unprecedented legitimate demand of the railroads and of manufacturers and merchants. If the country at large has not been speculating in Wall Street, it has gone extensively into real estate operations; and its investment in a variety of mining stocks has been inordinate."

The crisis of 1907 brought to the fore agitation for reform of our banking system. In that panic, as well as those of 1873 and 1893, the credit stream was frozen, clearing house certificates had to be issued and premiums were paid for cash.

How Frozen Credit System Wrought Disaster

The disaster wrought by the paralysis of the credit system in 1893 is forcibly described by THE IRON AGE of Dec. 28 of that year:

"Assets that were not capable of immediate conversion into cash have been no better than worthless paper in meeting the demands of creditors, and many sound business men have for the first time realized how suddenly riches can take wings. . . . The public soup house, which has only been known at rare intervals in American history, has become an institution in every city and in most of the large towns. Starvation threatens many a man of brawn and brain who is willing and anxious to work but unable to find employment."

Currency virtually disappeared in the 1893 crisis. Manufacturers failed with assets largely in excess of liabilities. Banks went to the wall with their safes filled with good securities. Merchants were ruined who lacked only a comparatively small amount of cash to discharge pressing liabilities.

The passing of the Federal Reserve Act has undoubtedly protected us from a paralysis of our credit system such as developed in varying degrees in 1893, 1907 and other commercial crises. On the other hand, it has not freed us from cycles or panics. Alternations in the flow of business are apparently inevitable under a system of private property. Private enterprise is necessarily speculative. The wide gap between producers of basic materials and consumers of finished products, the delicate relation between demand and prices, the psychological factor of optimism begetting optimism and pessimism begetting pessimism, thereby warping business judgment and leading to overexpansion or drastic retrenchment—all make swings in business inescapable, even though money is sound and stable.

Monetary instability merely accentuates the oscillations.

The Panics of 1920 and 1929

Our last two severe crises, although both brought on by excessive speculation, were in some other respects in marked contrast with those of the 19th century. Too rapid expansion, particularly of our railroads, figured prominently as causes of the panics of 1857, 1873, 1884 and 1893. The crisis of 1920, on the other hand, was precipitated by a sudden release of restrained demands following the repression of peace-time needs during the World War. The panic of 1929 came with the sudden break of the longest sustained bull market in securities ever experienced in this country. The sharp inflation of stock values was made possible by a tremendous increase in our supply of monetary gold, as a result of the war. In July, 1929, our gold holdings totaled \$4,324,000,000, compared with less than \$2,000,000,000 in January, 1914. Curiously, no general commodity price inflation, such as occurred in 1920, accompanied the rise in securities. On the contrary, a slow downward tendency in commodity values developed. This conflict in trends is easier to understand when the changed economic conditions of the country are considered.

The Ills of a Mature Industrial Nation

The era of extensive development of our resources came to a close at about the beginning of the present century. The frontier had disappeared, the westward march of the farmer had ceased, the entire land was traversed with great railroad systems. The United States had reached industrial maturity.

With this change came a decline in the rate of increase in manufacturing. The annual rate of gain in the last 30 years of the 19th century was 6.9 per cent as compared with 3.8 per cent in the first 30 years of the present century.

This decline was accompanied by an accentuation of competition for the available market. That competition became particularly noticeable after the World War, when industry found itself with greatly expanded capacity. With opportunities for exploiting natural resources largely a thing of the past, manufacturing genius turned its attention to stimulating consumer demand. The so-called "high wage" theory came into prominence. It was found that mass production sharply reduced costs and permitted price reductions that greatly widened the market for goods. A small margin of profit,

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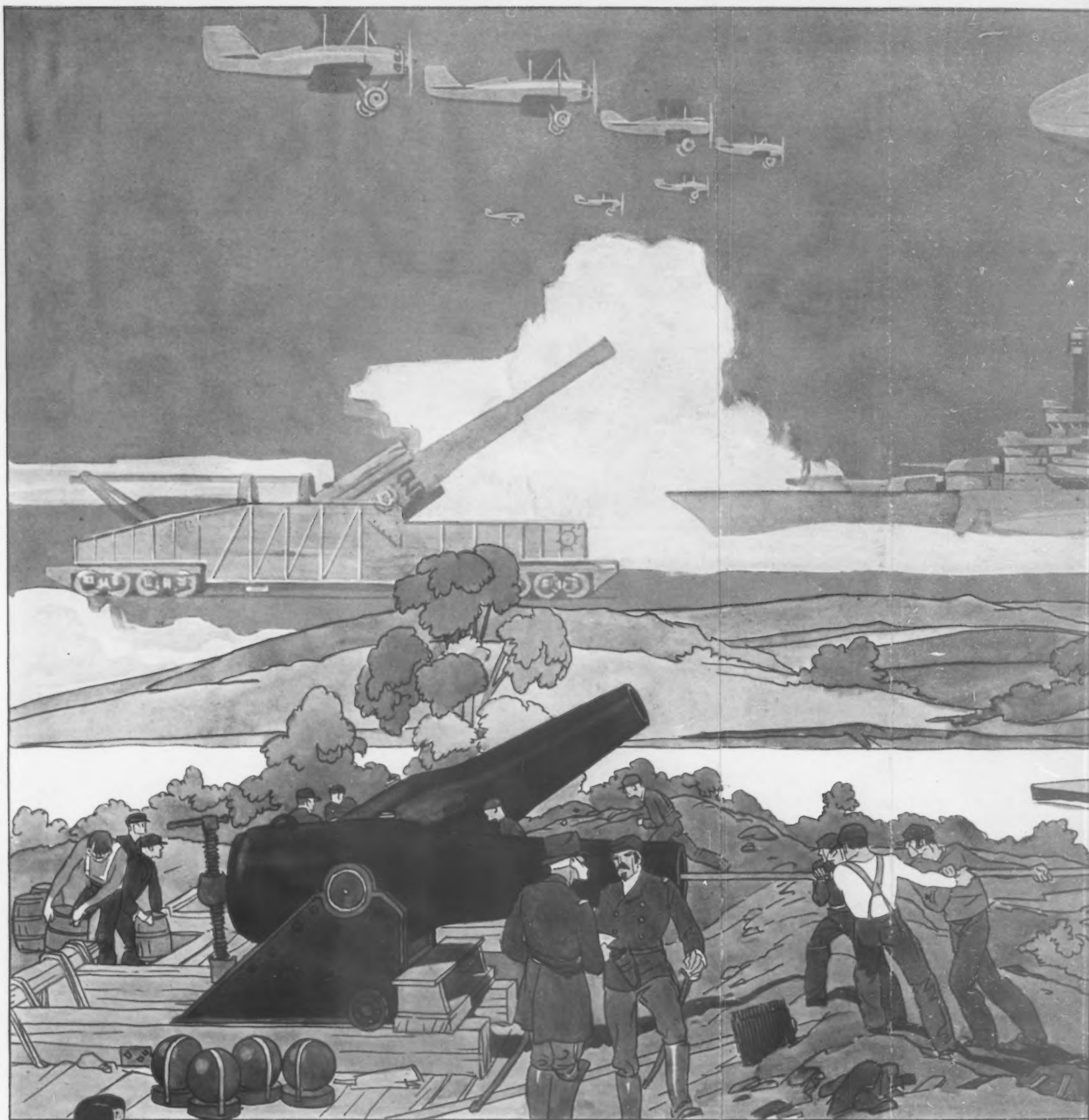
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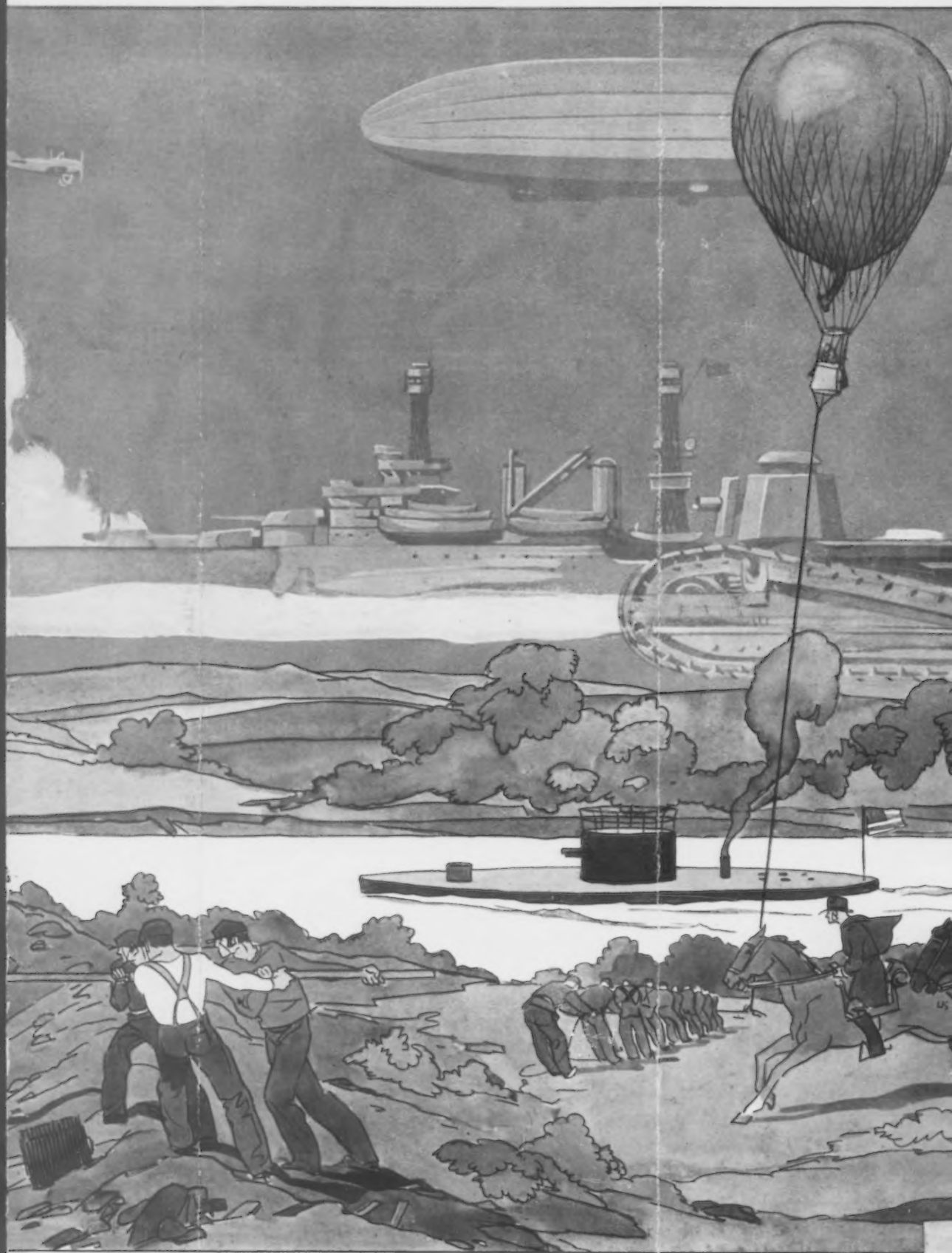
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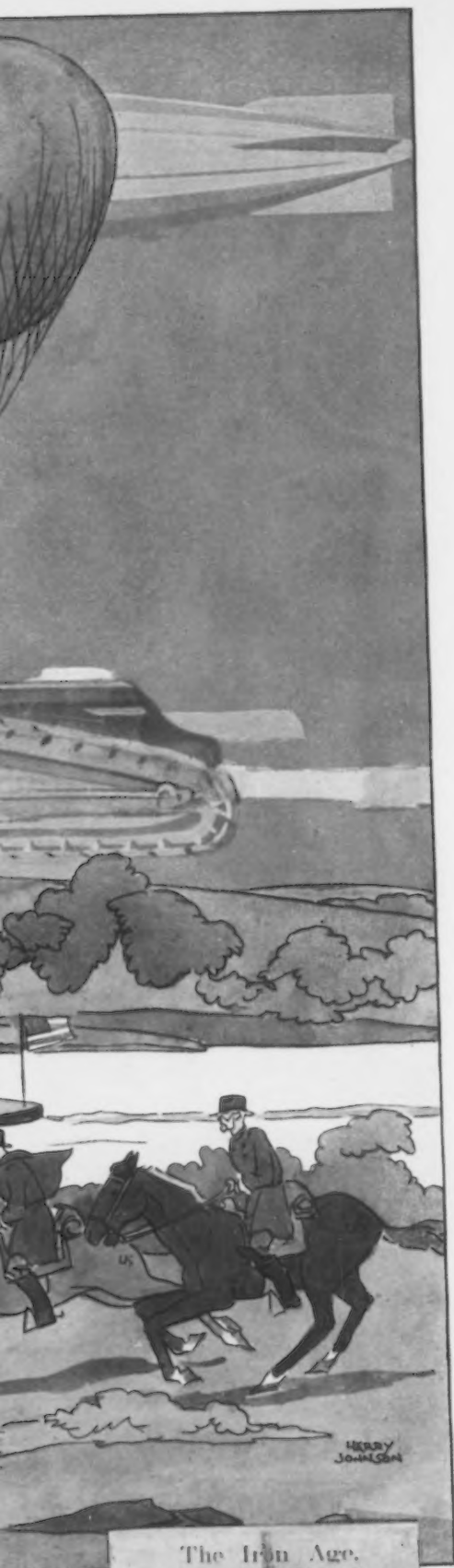
✦ Marching soldiers and the roar of crude cannon mark this early part of the Civil War. Ericsson's "cheese box on a raft" defeats the Merrimac. Zeppelin's captive balloon flies above Federal lines. ✦ The infant of 1855 is now a child of seven. He will live to see the fulfillment of the miracle of progress miraged in the sky of this picture. Within

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his lifetime the Monitor will become the modern
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into the railway gun, the captive balloon will be-
come the world-girdling dirigible. ✚ Unbelievable,
almost, this rapid development in the tools of War.
Yet equally rapid and amazing will be the develop-
ment he shall witness in the tools of Peace.



multiplied many times, proved more important than a large profit on a smaller volume.

Technological Unemployment Appears

But increasing pressure to perfect management and equipment as a means of lowering unit costs resulted in reduction of personnel, which has been termed "technological unemployment." The number of wage earners in manufacturing establishments in the United States in 1919, as reported by the Department of Commerce, was 8,998,000; by 1927 the total had shrunk to 8,350,000, notwithstanding a growth in population. The theory was advanced that those dispensed with by industry were being absorbed in new service occupations, since it was known that the same principles of efficiency operating in manufacturing were also reducing labor requirements in both distribution and agriculture.

Overstimulation of Consumption

Even though this view may have been well founded, the present depression has brought out in bold relief the inadequacy of general purchasing power to support a high rate of industrial activity. Expansion of consumption prior to the panic was achieved by inflation of consumer credit. In other words, our tremendous gold holdings served, not as a basis for price inflation, but rather as a lever to raise consumption to a parity with production.

Although instalment selling had been practiced for half a century, it is only in the last decade that it has become a major economic factor. From 70 to 90 per cent of all the gas stoves, phonographs and radios, automobiles, furniture, mechanical refrigerators, washing machines, pianos, sewing machines and vacuum cleaners are sold on a deferred payment basis, according to Magnus W. Alexander, National Industrial Conference Board. Total instalment purchases, he states, amount to \$5,000,000,000 to \$6,000,000,000 a year, and the aggregate amount of currently outstanding instalment paper is estimated at \$2,000,000,000 to \$2,500,000,000, which is equal to about one-half of the annual new savings of the population, as represented by savings deposits in banks, building and loan associations and by net life insurance premiums paid.

Stock market profits, actual or paper, undoubtedly induced excessive purchases of consumer goods. Those who did not speculate in securities were influenced to load themselves up with instalment goods because of the general spirit of optimism that prevailed.

The aftermath has brought the realization that inordinate bulges in demand, made possible by mortgaging expected income, must be followed by proportionately sharp dips. This is what is meant when men eminent in the affairs of the country state that there has been overproduction. In other words, output before the panic was matched by a rate of consumption that our population could not keep up.

Domestic Saturation and Export Obstacles

Aside from the inadequacy of consumption per se, the formula of mass production has encountered another difficulty—the attainment of market saturation. It is difficult to convince the buyer that he needs more than one vacuum cleaner, radio, sewing machine or washing machine, although in some instances he may regard it desirable to possess more than one automobile. It is this fact that has caused many manufacturers to look abroad for outlets. But rising tariff walls are an obstacle, and the alternative of building factories in other countries neither increases output in American plants nor provides more work for American labor.

In addition to maladjustments arising from the conditions just described, there are others that largely escaped attention during the "new era" period of prosperity. While business as a whole flourished, certain industries, such as textiles and shoes lagged, while agriculture and coal mining suffered uninterrupted depression. If the present slump will bring these branches of business into better balance with the rest of our economic life, the foundation will be laid for a broader prosperity than that which came to an abrupt close last year.

A Maze of Post-War Problems

Many new foci of discontent and new alignments of interest have grown out of the World War and the attainment of industrial maturity, greatly complicating the problem confronting industry. The working classes, after obtaining a tariff on labor, are becoming increasingly restive as the dislocations arising from technical improvements in production become more frequent. Although satisfied that their wage rates are not in danger of drastic reduction, they now demand security in their jobs. The old alternative of taking up free land is gone.

White collar workers, suffering more and more from the reductions in personnel attending mergers, and small merchants, driven out of business by chains, are joining the ranks

of the dissatisfied. Farmers, confronted with the depressed demand of an impoverished Europe and forced to sell at the lowest prices in many years, can no longer be counted on as supporters of a protective tariff. Bankers, having acquired a tremendous stake abroad by floating private loans, are veering to the side of free trade and advocating wiping the slate clean of Government loans to Europe. The tax-paying masses oppose assuming the great burden that cancellation of war debts would bring. Most manufacturers, as well as the many thousands in our middle and laboring classes who have acquired stock in our industries, are against a lowering of tariff barriers that would release a flood of imports, even though Europe must sell us to reduce its indebtedness.

In this maze of conflicting influences it is difficult to find a dominant trend. But manufacturing genius and enterprise is the strongest force in American life today, and the momentum acquired in perfecting production, cultivating markets and expanding consumer buying can be counted on to sweep it over all obstacles.

Healthy Growth of Consumer Buying Power Needed

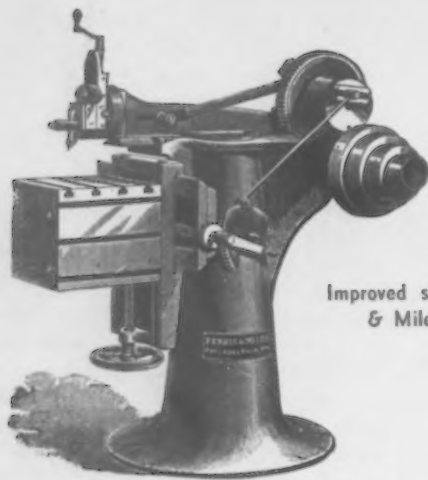
The effects of overstimulation of consumption through consumer credit expansion and stock market inflation have only caused industry to concentrate more energetically on the problem of bringing about a genuine, sustained increase in consumption. Since the supposedly magic formula of making more and more goods with fewer and fewer employees has revealed its limitations, new principles will be evolved. Economies in manufacturing will be found that do not hinge on increased output. New consumer products will be developed to provide work for the technologically unemployed. The achievement of both of these aims will be accelerated by technical and market research. And the gaining of those ends will again demonstrate that productivity creates purchasing power.

The Iron Age Started Metallurgical Column in 1869

A METALLURGICAL column was started in this issue of THE IRON AGE. The subjects discussed in this number were, rolling wide plates of iron, an improved chrome iron for the manufacture of rails and aluminum bronze for staircase coverings, the effect of heating upon the strength of metals, water for steel hardening, etc.

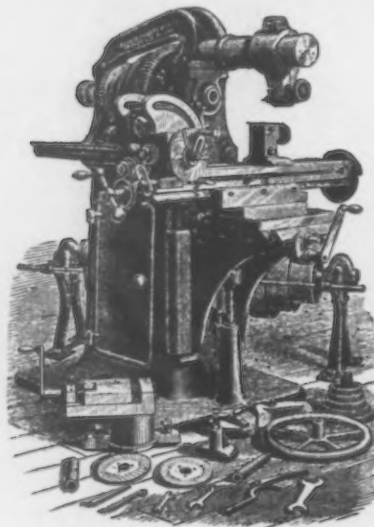
MACHINE TOOLS AS THE THEM FIFTY

By
R. E. MILLER



Improved shaper, Ferris
& Miles—1877

(Below) Universal mill-
ing machine, Brown &
Sharpe Mfg. Co.—1877

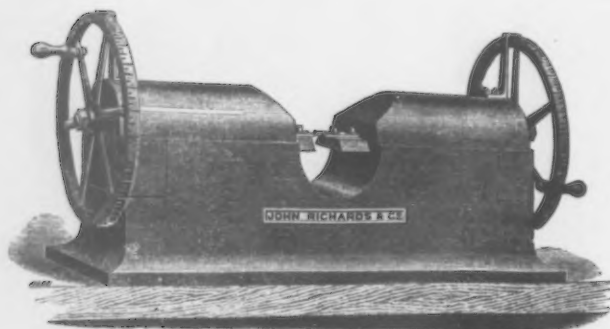


USE of cone pulleys for driving and feeding the work at different rates was the order of the day. As time went on, more positive variable-speed and feed change transmissions, electric drive, centralized control, automatic lubrication and other features were developed, culminating in the much heavier, more powerful, and more highly productive Master Tools of today.

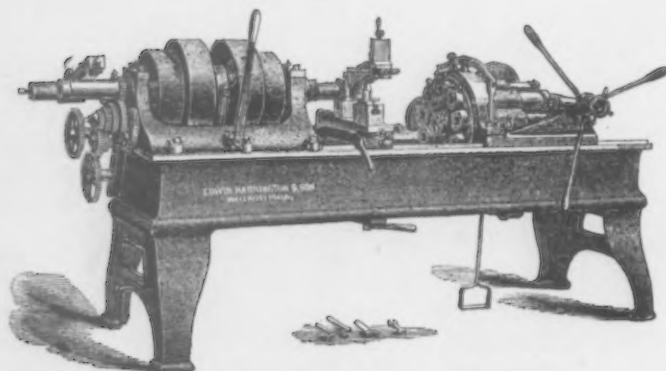
ANNOUNCEMENT of new and improved equipment has been made by THE IRON AGE since its earliest years, and about 1870 the woodcut was adopted for illustrating such announcements. Some of the machines, and a comprehensive gaging system, described in the 1870's are reproduced herewith, while notes relating to the construction and claims made for these machines are appended in paragraphs below.

In the improved shaper built by Ferris & Miles, Philadelphia, in 1877 "special pains were taken to secure greater driving power than usually possessed by machines of this kind. . . . It is powerfully geared from the driving shaft, the gears being in the ratio of 6 to 1, while the cone is made quite large, with four steps for a 2½-in. belt."

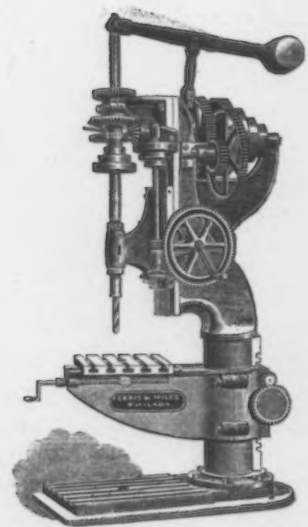
This Brown & Sharpe universal milling machine, according to THE IRON AGE of May 31, 1877, was offered for steam engine, locomotive and other heavy work. Cutters up to 8 in. in diameter were used; six changes of feed and speed were obtainable. Spindle boxes were of hardened cast steel and both the boxes and the spindle bearings were



Standard measuring machine, Richards, Hand and Taylor—
1879



Horizontal turret lathe, Edwin Harrington & Son—1877



Upright drill, Ferris & Miles—
1877

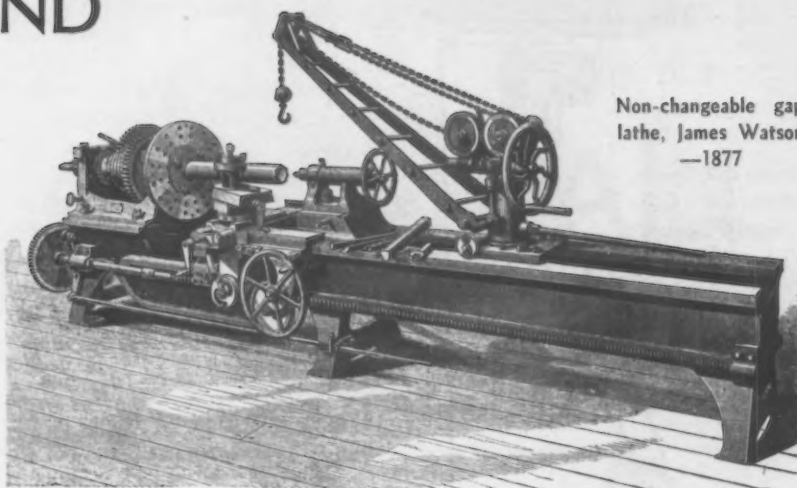
IRON AGE FOUND YEARS AGO

carefully ground. The weight, complete, was 3800 lb.

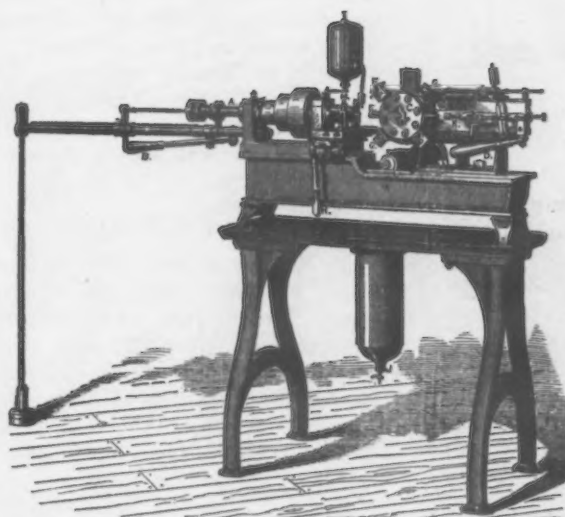
Convinced that "at this time (1879) no subject connected with the machine-making industries demands more attention than standard sizes, we (THE IRON AGE) have decided to devote some space to the subject."

Accordingly an article on "The Gauge System" featured the issue of Jan. 30, 1879. It is introduced with this: "The extent to which standard sizes or gauged dimensions have already entered into American mechanical industry is scarcely suspected. Not that we have been sooner to adopt gauging implements in general, but have been among the first to perceive the economic effect of making duplicate parts, and in that way securing a more extended division of labor than was possible in the old world."

Discussion of the subject was "aided by Messrs. Richards, Hand and Taylor of the American Standard Gauge & Tool Works, Philadelphia, who have furnished engravings of their gauging implements and of some of the machines employed in adjusting." In addition to the standard measuring machine

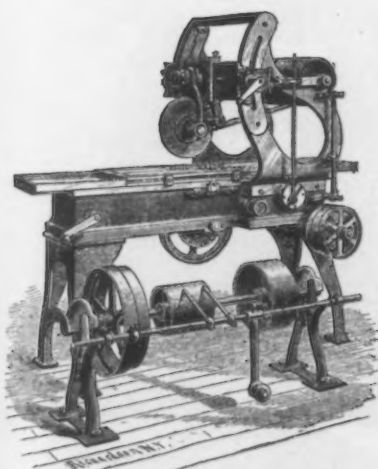


Non-changeable gap
lathe, James Watson
—1877



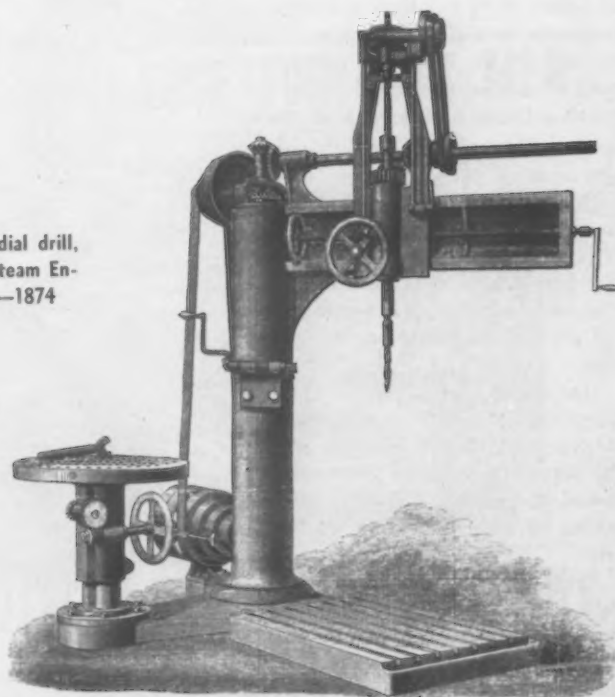
Self-slotting screw machine, Hubbel Screw Co.—1876

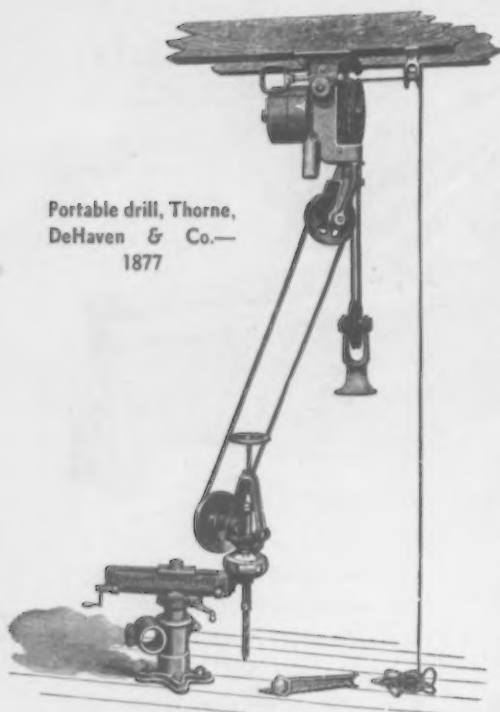
▲ ▲ ▲
FREQUENT reference to time and labor saving in the descriptions of these machine tools, selected from THE IRON AGE of 1874, 1876, 1877 and 1879, reflects active demand then, as now, for economical as well as accurate operation.
▼ ▼ ▼



Surface grinding machine, Brown & Sharpe Mfg. Co.—1877

Improved radial drill,
New York Steam Engine Co.—1874





here reproduced, these illustrations included fixed shop calipers; corrective gages to prove the fixed calipers and keep them to standard size; also pin and collar, or cylindrical, gages, and caliper machines, "which do not measure . . . but record as the work approaches size."

Of the horizontal turret lathe made by Edwin Harrington & Son, Philadelphia, *THE IRON AGE* of June 28, 1877 said: "Vigorous competition and low prices have so stimulated the ingenuity of our manufacturers that the market is constantly being supplied with tools of special character, designed to facilitate divisions of labor, or to combine a variety of processes in a single machine, thereby saving an immense amount of time otherwise consumed in the frequent shifting and setting of work."

The live spindle was driven by two sets of cones, of two changes each, one set driving forward and the other backward, controlled by a friction clutch located between them. The turret head contained nine spindles, each capable of receiving a tool for performing some particular service.

"In many jobs," says the description, "the difference in rapidity of execution by this machine and by the old methods is as great as 3 to 1, and the makers claim to effect a saving in time and labor of 75 per cent."

Features of the upright drill built in 1877 by Ferris & Miles, included facility of feed manipulation. "The lower end of the spindle never leaves its bearings, but bearings

and all move down together in the same relative positions," says the description. The machine was said to combine "great power and stiffness, without excessive weight."

The "non-changeable" gap lathe made by James Watson, Philadelphia, was exhibited at the Centennial Exposition and described at length in *THE IRON AGE*. The gap admitted work 48 in. in diameter. A faceplate could be attached to the back end of the spindle and wheels 9 or 10 ft. in diameter bored, the hole in the spindle being such that boring bars as large as 4 in. could be passed through it.

"The Hubbel patent" self-slotting screw machine brought out by the Hubbel Screw Co., in 1876, was for manufacturing screws from solid rods or blanks. Advantages stressed by the makers included the "milling, threading, cutting-off and slotting of the screw in three motions. . . . There is no reverse motion of the countershaft." The throwing of a continuous stream of oil on the cutters and dies was also a feature emphasized.

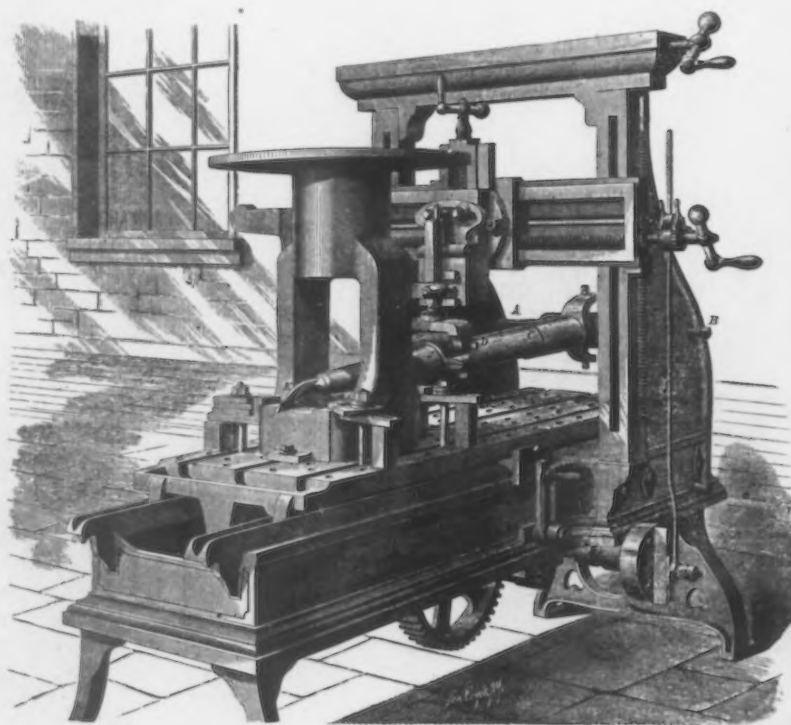
Surface Grinder of 50 Years Ago

The surface grinder built by the Brown & Sharpe Mfg. Co., Providence, "for flat and true surface grinding and finishing," was featured (1877) as an effective substitute for the operations of filing and stoning. Using a 12-in. wheel, work 14-in. wide, 36-in. long and 13½-in. high could be ground. The weight of machine, complete, was 2000 lb.

The radial drill built by the New York Steam Engine Co., New York, was featured in 1874 as meriting "special mention on account of its size, excellent construction and accuracy of work produced." It was capable of drilling to the center of 7 ft. "All wrought iron is case hardened, and the spindle is of steel." A self-acting feed having three changes was provided.

Thorne, DeHaven & Co.'s (Philadelphia) portable drill, characterized as having achieved considerable celebrity both in this country and abroad, was offered for use on large castings requiring cumbersome and expensive machinery and much time and labor for their handling. Of this machine *THE IRON AGE* said: "It is but one of the numerous cases in which the hand has been superseded by more rapid and reliable combinations of mechanism." As to production: "An employee of the Fulton Iron Works, St. Louis, states that with a 1½-in. tool he drilled, in a 7-ft. circle, 22 holes, 2-in. deep and 10 holes 3-in. deep in 5 hr., which is a satisfactory result."

Shaw's planer bar, described in the first issue of 1874, was developed "to permit ordinary planing machines to perform the work of shaping and slotting machines, and to plane through, under and over work through apertures and between high projecting parts, in a thorough manner, never attempted heretofore on a planer. It excels the slotter and shaper by reason of the extra length of work it will penetrate."



Shaw's planer bar—1874

INDUSTRIAL ADVERTISING HAS CHANGED CONSIDERABLY

USE ONLY

GENUINE OLD RELIABLE

A.F. PIKE MFG CO.
PIKE STATION, Grafton Co., NEW HAMPSHIRE, U. S. A.

BLACK DIAMOND BLUE STONE
For all kinds of work, especially for cutting and grinding.

GENUINE BLUE STONE
For all kinds of work, especially for cutting and grinding.

WHITE MOL STAIN
For all kinds of work, especially for cutting and grinding.

PIKE MFG CO.

**LOOK OUT
FOR THE
FALL
TRADE.**

H. W. HILL & CO.,
H. W. HILL,
C. F. HOUSUM.
DECATUR, ILL.

BUY COVERT'S ROPE HALTERS, HORSE AND CATTLE TIES, HALTER LEADS, WEIGHT CORDS, HITCHING CORDS, Lariat Tethers and Picket Pins, &c.
Sold by all leading Jobbers in General and Saddlery Hardware
COVERT MFG. CO.
West Troy, N. Y.

BUY COVERT'S HARNESS SNAPS, Open Eye Bit and Chain Snaps, SNAPS and THIMBLES For Horse and Cattle Ties, BREAST CHAINS, Halter Chains, Rein Chains, Post Chains, &c.
Sold by all leading Jobbers in General and Saddlery Hardware, at factory prices.
COVERT MFG. CO.
West Troy, N. Y.

HERE are some interesting advertisements, reproduced from The Iron Age of 1867-70. Previous to that time, most of the advertisements consisted of announcements, in type of variegated styles and sizes. Illustrations were in the minority, hand engraving being expensive.

BEST INSURANCE FOR IRON MEN.

Accident Insurance.

Try a Yearly Policy.

TRAVELERS INSURANCE COMPANY,
OF HARTFORD, CONN.

SHADOWS OF THE MODERN

MORE than half a century ago The Iron Age foresaw the age of machinery with its mass production and lowered costs, the development of a great export trade in machinery, the rise and decline of our steel trade with Japan, the steel railroad car, automatic signals, aluminum for cooking utensils, modern warships and aircraft in warfare.



MODERN NAVIES

IN the warship of the future, speed and easy handling are qualities which are far more likely to be the objects sought for than protection against shot and shell.—May 31, 1877. Comment on the development of the torpedo.



AIRCRAFT IN WAR

FOR military purposes its (the balloon's) value is as yet undreamed of; and inasmuch as the governments of this and other countries are now busied in testing and perfecting the means of submarine warfare, it would be well if those adapted to the upper air should receive more attention against the time of need.—Oct. 23, 1873.



METAL DIRIGIBLES

THERE seems to be no good reason (unless the one of expense) why a balloon, or at least the upper and more exposed half, could not be successfully made from aluminum. * * * It would be an advantage with this form of balloon more than any other, to use pure hydrogen, which is considerably lighter than the street gas.—Oct. 2, 1873.



AUTOMATIC RAILROAD STOPS

WHETHER it would not be well to add to them (railroad signals) some means of stopping a train by the volition of the signal man, without necessarily the intervention of brakeman or engineer, is one well worthy of cogitation.—June 19, 1873.



STEEL RAILROAD CARS

THE most obvious remedy, or rather preventive for the danger mentioned (fires in railroad wrecks) is to make the cars incombustible. To do this with iron involves, however, an entire change in car architecture, and one that will annihilate the ornamental appearance now so much in favor, both with railroad men and with the traveling public. Nevertheless, I am disposed to think that eventually iron and steel will form the standard material of car construction, but the time is not near at hand.—May 15, 1873.



ALUMINUM FOR COOKING UTENSILS

STORIES have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead, and the formation of verdigris on spoons of alloyed silver; and if people were only determined to produce these utensils from aluminum, all danger from poisoning would be removed, and they would have vessels the appearance and durability of which would scarcely leave anything to desire.—Aug. 28, 1873.



COMING OF MANGANESE BRONZE

MANGANESE bronze by virtue of greater strength and more reliable character will find an application wherever gun metal is employed, while the facility with which it can be forged, and the benefit it derives from the operation, will render it still more useful as a constructive material.—March 30, 1876.

ERA A HALF CENTURY AGO

AIR CONDITIONING

MUST we wait till the next generation introduces the latest improvements before we can have both hot and cold air, as well as hot and cold water, in our houses!—Aug. 30, 1877.



TYPE-SETTING MACHINES

THE type-setting machine ranks with the steam cotton picker, the field corn husker and the steam plow as one of the greatest mechanical problems and needed inventions of the age.—March 27, 1873.



MASS PRODUCTION

COST of production is diminished in a ratio proportionate to the increased production and, while the price of goods may be lower, the profits are proportionately raised. The cheapness of the goods thus produced will by necessity demand for them a larger market and the manufacturer would find that instead of overproducing he was unable to keep up with the steadily increasing demand for his wares.—April 13, 1870.



A NEW ERA OF PRODUCTION

IN machinery, another century will witness great changes, and many things will become possible which are now far beyond our reach. We may expect a steady and perhaps rapid progress in the substitution of machinery for hand labor, which will be attended with great benefit to all classes of society. There seem to be no limitations to progress in this direction, until we shall reach the point where intelligence is needed; but this point seems to be constantly receding and probably we shall never know where automatic action ceases and intelligent action begins.—Nov. 23, 1876.



OVERPRODUCTION?

IT only remains then for the manufacturer to solve the problem of how he can manufacture his goods most cheaply; and when he has learned the important truth that, if he can manufacture cheap enough, he can indefinitely increase his production without exceeding the demand for his products, this question may be easily answered.—April 13, 1870.



LABOR SAVING EQUIPMENT

NOTHING that stimulates and cheapens production injures life in any sense and the more machinery a nation has in active operation the more fully and profitably is its labor skilled and unskilled employed; the more rapid its material progress toward the highest standard of civilization.—April 11, 1872.



MORE MACHINERY EXPORTS

AS we have repeatedly said during the past two years we believe that the opportunity is now developing for the establishment of a growing and profitable export trade in manufactures of iron, more especially machinery, tools and implements of labor, a department of invention in which American genius has achieved a signal triumph.—Jan. 9, 1873.



JAPAN SELF-SUPPLYING

WHEN we consider that all these efforts (toward developing Japanese industry) are the fruit of the last few years, less than a decade, indeed, it is impossible not to see in such industrial development a sure presage of further advance, and the approach of a time, not far distant, when although the Japanese have almost denationalized themselves by the adoption of all things foreign and the creation of a whole circle of new wants, they will be quite able to supply them all from the work of their own looms and shops, and leave a very small margin for the foreign importer in a market which he fondly hoped would, with its thirty millions of inhabitants, afford him a permanently profitable field.—Nov. 18, 1875.



THE NEW JAPAN

GRADUALLY, from a large importer of finished products, Japan is apparently slowly working into the position of an importer of semi-finished and raw products for conversion in its own finishing mills.—July 29, 1926.



The Editor of The Iron Age Builds a Bullet Proof Car

DESCRIBING a bullet proof railroad car ordered in the United States by the Spanish Government for use in Cuba, THE IRON AGE of May 3, 1877, quotes the Baltimore Sun to the effect that "there has just been completed at the car shops at York, Pa., the first bullet proof car ever manufactured in the United States. The car is 31 feet long, 8 feet high, and furnished with all the latest improvements in ventilation, etc. The body below the windows is covered with $\frac{3}{8}$ inch iron and panels between the windows and the body above them are covered with $\frac{3}{16}$ inch steel. The windows can be closed with steel slides, and when they are down the entire car is bullet proof."

In comment on this news, THE IRON AGE points out that "this may be the first bullet proof passenger coach, but it is certainly not the first bullet proof car ever built in the United States. The writer assisted in 1862 in building a bullet proof car which was used for some time on the Atlantic and North Carolina Railroad, then run by the United States military forces. The car was made by putting up a stout frame on an ordinary flat car and boarding it over, the planking being covered with boiler plate on the sides and old rails on the ends, which were inclined. The car was armed with a small brass howitzer and had a number of loop-holes for musketry. It was shown to be bullet and even shot proof by actual demonstration on several occasions."

"The Fire Risk of Steam"

ON Friday evening a meeting of the Polytechnic Branch of the American Institute was held in Cooper Institute to consider the question of the danger of conflagration resulting from the presence of superheated steam and pipe when contact with woodwork is permitted.

Prof. Van Der Weyve opened his remarks by saying that the condition of the question was at the present time the same as it had been when it was first introduced to the public. He referred briefly to the period when gas was first used to illuminate cities and the great noise which was then made by alarmists in regard to the dangers by which it was attended. Now all those futile fears were obsolete and accounted silly. It was so with steam as a means of radiating heat

through buildings. There was now raised the cry against it. When properly understood it would be found to be safer than any other medium. He deplored the fact that some persons were driven by prejudice to ascribe every fire which occurred to the heat of steam itself. Mr. Wiard then took the floor in support of his theory citing numerous instances from the experience of various engineers of combustion supposed to have been caused by superheated steam.

A gentleman here interrupted the speaker to relate an instance in his remembrance where the roof of a wooden shed in Williamsburg was ignited by a steam pipe in contact with it.

Fire Marshal McSpedon said that since the discussion of superheated steam had begun an example of the truth of his theory had come in a very apropos manner under his notice. In the Harlem Gas Works the roof had been set on fire by the contiguity of the steam whistle with the wood.

*Extract from The Iron Age,
Jan. 23, 1873*

The Income Tax in 1871

A CORRESPONDENT called attention in our columns a few days ago to certain changes in the internal revenue law, which the assessors have apparently overlooked in preparing blanks for the income tax this year. The sources of income which are to be included are indeed defined by the law, but no one is compelled to disclose them to the assessor. It is only enacted that every person liable to the tax shall make and render a return of the gross amount of his income, gains and profits as aforesaid. An exemption is allowed for anyone whose income did not exceed \$2,000 during the year.

*Extract from The Iron Age,
March 30, 1871.*

Friction Saw in 1871

THE Phoenix Iron Company are fixing up a circular saw in their machine shop, intended for sawing large beams and shafts of iron in a perfectly cold state. Upon inquiry we learned that the saw is intended to make 3000 revolutions per minute—will have no teeth, being perfectly smooth, the work to be accomplished totally by friction.

*Extract from The Iron Age,
June 29, 1871.*

Origin of Electroplating Was Accidental

THE application of electrometallurgy to the arts was an accidental discovery. In 1830 Mr. J. P. Wagner of Frankfort and Prof. Jacobi of St. Petersburg were endeavoring to apply electromagnetism as a motive power instead of steam. Jacobi employed a Daniell's battery consisting of an outer cup of copper and an inner cell of unglazed porcelain which contains the zinc rod. The intermediate space is filled with a saturated solution of sulphate of copper. Once when Jacobi was busy with removing a deposit from his copper cup he noticed that there were several layers of copper, each having the form of the sides of the copper vessel and hence concluding that the sheet copper of which the vessel was made had split up into layers, accused the man who made it of employing a poor quality of copper. A closer investigation, however, showed him that these layers or leaves did not belong to the walls of the vessel, but to a new deposit of metal imitated in a remarkably perfect manner, the shape of the surface of the wall. It occurred to Jacobi that this troublesome disadvantage could be turned to profit by using it for producing objects.

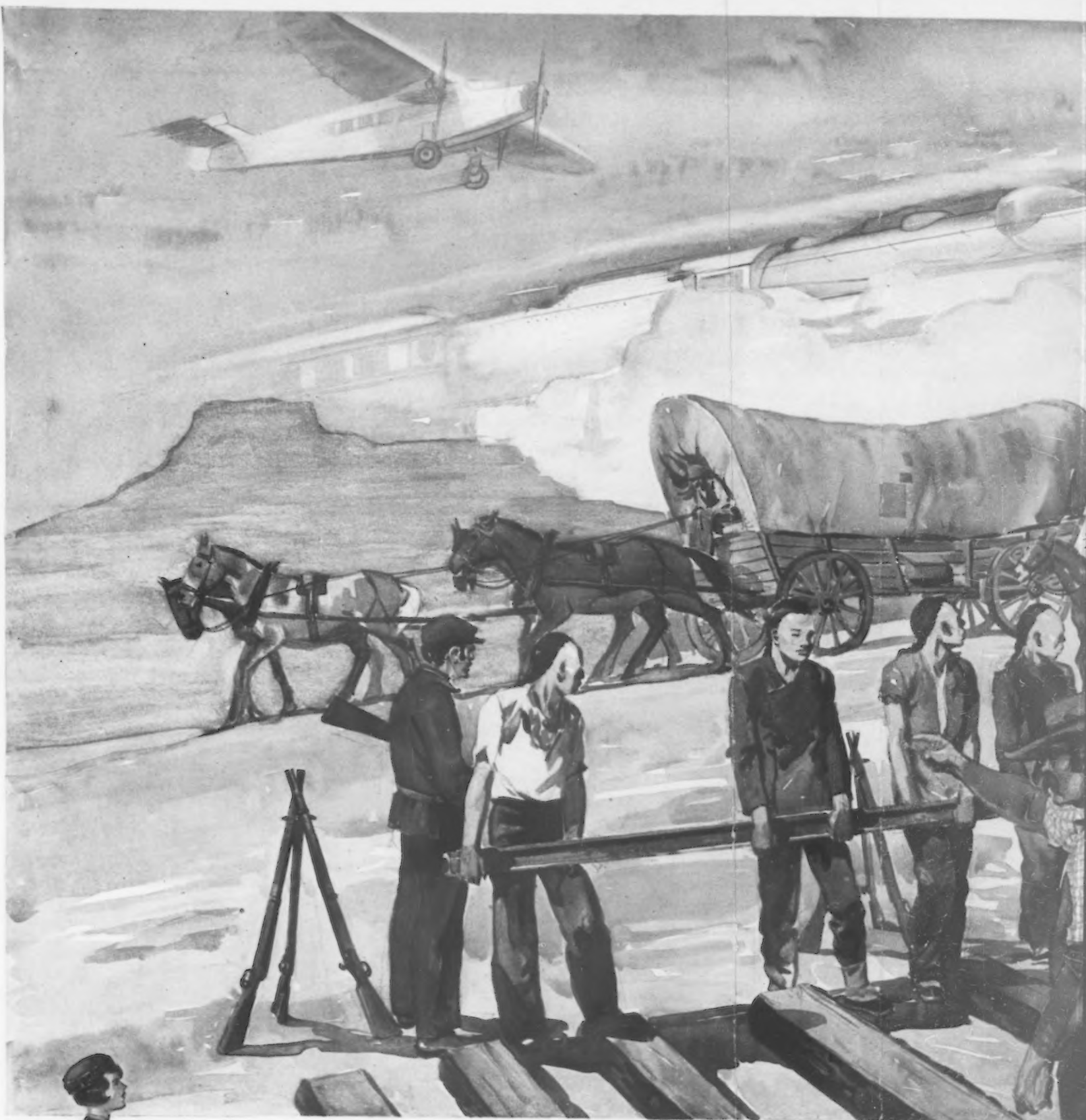
*Extract from The Iron Age,
April 23, 1874.*

Bonus for Engineers of the Pennsylvania Railroad—1868

WE give below the substance of orders issued a short time ago to the engineers and firemen of the Pennsylvania Railroad:

"At close of the year a calculation will be made of the amount of coal, tallow, oil, etc., used in running locomotives and the amount saved as compared with last year ascertained, and the money saved will be equally divided between the company, engineers and firemen. Printed monthly statements showing the performance of each locomotive, and giving the names of the engineer and fireman will be posted up in the engine houses. The consumption of fuel and stores in the motive department of the road last year was very great, and it is thought by paying attention to the above orders a considerable saving can be effected for the company, and the men at the end of each year secure for themselves a handsome bonus."

*Extract from The Iron Age,
May 28, 1868.*



...1869...

✠ The swords and guns of Civil War are now being beaten into rails and plowshares for the peaceful conquest of the West. The furnaces and mills which had fed the insatiable demands of Mars in his attempt to split the Nation asunder are now creating a network of steel that shall bind it firmly together through railroad transportation. ✠ The

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Nation asunder are now
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ad transportation. ✠ The

baby of 1855, now a lad of fourteen, watches with
eager eyes the completion of the first transconti-
nental railroad. The ring of sledge hammer on
steel sounds the death knell of the covered wagon.
Can this youth catch a glimpse, as a mirage in the
sky, of the modern air and rail transcontinental
express which is to come during his own lifetime?





ALLOY STEELS OF YESTERDAY, TODAY AND TOMORROW

By EDWIN F. CONE

A SIGNIFICANT development of the last quarter century has been the evolution of alloy steels. It is typical of the trend toward the improvement in the materials of industry which has been brought about by the progressive demands for increased strength, lightness and durability.

It is a characteristic of our industrial progress that, whenever an industrial demand is expressed, the solution of the problem of its satisfaction is forthcoming. In the earlier days of industry, long years elapsed between the appearance of the need and the coming of the means to satisfy it. The development of scientific research has shortened this period to a matter of months instead of years. Let a need be made known today, and tomorrow the research engineers of our laboratories are busily at work finding the way to its fulfillment.

Thus we may take, as an established trend of progress, the shortening of the period of incubation between idea and accomplishment. What scientific research has done in the development of alloys, non-ferrous as well as ferrous, as set forth in this article, may be taken as an indication of future progress in the improvement of the materials of industry, on a scale and at a speed that will increase with the undoubted growth of research.



It is quite generally conceded that alloy steels, as a class, had their origin comparatively recently—within the last 30 or more years. And yet, if one turns the pages of some of the early issues of *THE IRON AGE*, some interesting and surprising statements are found—some of them quite crude, it is true, in the light of present knowledge, but at the same time prophetic.

Early References to Chromium in Steel

UNDOUBTEDLY we live in an alloy age—we meet alloy steels, special alloys, both ferrous and non-ferrous, everywhere. Were one to ask what metals are now the most prominent in the alloy steel field, naturally chromium and nickel would be named first. These two alloying metals play the major role

in the great bulk of the present-day alloy steels.

It is surprising but certainly informing to find, in *THE IRON AGE* in the 1870's, statements regarding, for example, the early use of chromium. Probably no other alloying metal is so large a factor in the commercial development of the alloy steels of today, associated particularly with nickel.

On Jan. 19, 1871, *THE IRON AGE* published a statement regarding the discovery and patent of one Julius Bauer. Extracts from this article which follow show that a chrome steel of certain qualities was then being produced. Heat treatment must have been practiced to bring out physical properties of the order mentioned in that statement.

“AMONG the improvements of late years introduced into steel making, none strike the observer as so novel in principle as the process indicated by the above name. It is the patented invention

of Julius Bauer, a chemist of practical and methodical mind, with an extended experience in the metallurgy of iron. His claims chiefly consist in the employment of chromium in lieu of carbon for the prompt conversion of wrought iron into a kind of cast steel. . . .

“The editor of *THE IRON AGE*, deeming the subject of interest to its readers, determined to see for himself how this steel was made. He made a visit by invitation to the works of the Chrome Steel Co. at Williamsburg, Brooklyn, which was the only manufacturer under this patent in this country, the process having been used here for about 3 years by another company, which this one succeeded. . . . The company making this chrome steel claims that the metal is superior to anything in this country or in Europe. They describe its properties as follows:

“It can be worked at a white heat and cannot be injured by overheating. It can be welded to iron or to

"CHROMEISEN AS A SUBSTITUTE FOR SPIEGELEISEN"

EXPERIMENTS prove that by using chromeisen instead of spiegeleisen, extremely soft steel is obtained; rods made for experiments were very easily bent, even by hand. It is seen from these attempts to replace spiegeleisen by chromeisen that the use of the chrome-iron alloys is limited, and the steel obtained is for most purposes too soft for the manufacture of such materials as rails, axles, tires, etc. According to the *Chemical News*, during some experiments with the chrome-iron alloys, a strange phenomenon was observed. It is well known that chromium is extremely hard and scratches even hardened steel. Meanwhile an alloy was obtained which was malleable, and in a fresh state could be easily bent. The above mentioned alloy was analyzed, and the following average composition was found: Metallic iron, 96.40 per cent; metallic chromium, 2.30 per cent; carbon, traces; lime, silica, 1.30 per cent; total, 100 per cent. By melting a mixture of cast iron, tin and lead in the following proportions, a very liquid alloy is obtained: Cast iron, 79 per cent; tin, 19.50 per cent; lead, 1.50 per cent; total, 100 per cent. The alloy has a very handsome appearance, and fills perfectly well the casting molds; thus it could be used for casting small articles. The alloy is to some degree malleable.—THE IRON AGE, April 6, 1876.

itself, leaving no trace of the weld; it can be worked and reworked without injury; they claim that, when made into a tool, it will do at least 50 per cent more work than any steel, not excepting the highest priced, and be perfectly uniform in each grade. Dynamic tests of this steel have been made by David Kirkaldy in London, also at West Point Foundry, which latter showed as the highest strength of 12 specimens 198,910 lb., lowest strength of 12 specimens 163,760 lb., average of all the specimens 179,980 lb. per sq. in., which is one-third more than Percy gives as the highest tensile strength attained in steel.

"It is further stated that, when made into wire, it will tie into knots and stand 400 lb. more in No. 16 than the wire used by hoop skirt makers; and Mr. Wood says that he can make a tool from it to drill through Stubbs's hardest file. The most indirect and curious compliment was paid it by parties who were recognized as illegitimate drillers, and therefore did not obtain what they wanted, i.e., tools to work through a chrome-iron safe."

As far back as April 6, 1876, chrome iron was mentioned. In another column that allusion is reproduced: "Chromeisen as a Substitute for Spiegeleisen." It refers to a compound of over 96 per cent iron and 2 per cent chromium with traces of carbon—"malleable and in a fresh state could be easily bent." Was this the beginning of the chrome steels and irons and chrome

alloy steels? Was this the early birth of the ferroalloy, ferrochromium? Certainly the steel maker of that day did not expect to use such a product as a substitute for a manganese-carbon alloy.

Tungsten Steel in 1876

The origin of high-speed steel is usually credited to the remarkable work of Taylor and White in the early 1890's. But in THE IRON AGE, May 4, 1876, a brief article discusses most interestingly a "special steel" containing tungsten, which had unusual cutting properties—perhaps at least the forerunner of the low-tungsten cutting steels of today.

The few citations from IRON AGE articles demonstrate conclusively that 50 to 60 years ago alloy steels were by no means unknown, but that there was very little known about their manufacture or properties. They were something of a curiosity. Chromium itself was not available in the form it is today. It was probably reduced from the ore in crucibles.

The birth of the American alloy steel industry of today should probably be credited to the work of Rossi, de Chalmers, Becket and others in this country working along more or less parallel lines with others in Europe. These pioneering investigators, with the aid of the electric furnace, made possible the production of special ferroalloys, such as ferrotitanium, ferrosilicon (50 per cent and higher), ferrochromium, ferrotungsten and so on. The ad-

vent about this time of the Goldschmidt thermit process supplied another source of special alloying elements. Much of the early work in these fields was done in the period of the transition from the nineteenth into the twentieth century.

Vanadium and Molybdenum Introduced

About this time vanadium was ushered in as another new alloying element. Responsible for its introduction were the Flannerys, J. Kent Smith, and others. Vanadium became a factor in perfecting the high-speed steels which appeared in those early days as the result of the epoch-making work of Taylor and White.

A few years later appeared another comparatively new alloying element that is gaining rapidly in commercial use in alloy steels—molybdenum. Its industrial use in complex alloy steels and special alloys is wide. Chrome-molybdenum steel has become essential in the airplane industry. The electric furnace made possible ferromolybdenum, which has largely given place to calcium molybdate for introducing the metal into steel.

These brief allusions to the early history of the American alloy steel industry would not be complete without mention of the role of nickel. This element, one of the oldest known, was early an important factor, particularly in the manufacture of armor plate. When the disarmament program went into effect, one large use of nickel was virtually canceled. Reading the handwriting on the wall, the nickel company organized a highly efficient research department. The result has been new alloy nickel steels and new nickel alloys, greatly increasing the demand for nickel.

Electric Melting Appears

PARALLELING these developments, as well as making high-grade alloy steels possible, particularly in quantity, was the introduction of the induction and arc electric melting furnaces. Stassano in Italy was an early pioneer as was Rodenhauser in Germany. But the work of Heroult in France has been more enduring as exemplified by the many furnaces of this type now in use. The achievements of Moore, Snyder and others in the United States have meanwhile also become outstanding.



American engineers and metallurgists, about 20 years ago, took up the electric steel melting furnace begun in Germany, France and Italy, and they developed it into an essential industrial melting tool, and today America leads the world in electric steels. Last year the output of alloy steels alone from electric furnaces was 433,096 tons as compared with practically none 20 years ago.

Demand for a strong material at the same time as light as possible has been an impetus to the development of alloy steels. Tool steel requirements have had their influence. The electric shaft or smelting furnace, of about 35 years ago, gave metallurgists the ferroalloys for introducing alloying metals into steel. Then the electric melting furnace made possible the production of high-grade steels from materials which could not be used in the crucible. Now every one of the crucible tool steel producers has installed an electric furnace. On top of this, perfection of open-hearth practice has made it possible to produce alloy steels in both quality and quantity.

Heat Treating a Large Factor

In the last ten or twelve years there has sprung up a new, or rather an old, art developed to high degree—that of heat treating. When iron or steel implements were first used, what is now crude heat treatment was practiced—on swords, daggers, cutlery, etc. But not until recently have the laws which govern the heat treatment of steel, as revealed by the microscope, been formulated. This fact alone is a potent item in the success of alloy steels.

No one needs to be told the place of alloy steels today. They have made the automobile the light, strong, dependable vehicle it is. The airplane could hardly be built without them. Longer-life springs, more efficient cutting tools, better ball bearings, more dependable gears lightened but stronger locomotives, bridges that span stretches not regarded feasible 30 years ago, structural steels of increased strength, corrosion and rust-resisting steels—all these have their foundation in alloys, ferrous and nonferrous, castings as well as rolled products.



Undoubtedly the latest triumph is the discovery and commercial production of the stainless and rustless steels.

WHEN WERE TUNGSTEN TOOL STEELS FIRST INTRODUCED?

METALLIC tungsten is so hard that it scratches glass easily, and so slightly fusible that it cannot be melted in an ordinary furnace. On the other hand, it may be mixed with iron by fusion in all proportions, and the larger the quantity of tungsten, the harder and more difficult to melt is the compound. Like carbon, it appears to diminish the ductility of iron both when hot and cold, but especially when cold. It is then possible, by melting together tungsten and iron, to obtain a steel much harder than one with carbon alone, without the danger of incurring at the same time an excessive fragility when cold, or difficulties of working when hot. For uses which require a special degree of hardness, a steel rich in tungsten, called "special steel," is frequently employed. Thus a fine Sheffield steel for lathe tools, according to an analysis made by Baron Barnekow in the laboratory of the Stockholm School of Mines, contained 9.3 per cent of tungsten, and 0.7 per cent silicon, with only 0.6 per cent of carbon. This steel, which is used without being tempered for turning cylinders, cast or hard iron, is of sufficient hardness and yet is not fragile.—THE IRON AGE, May 4, 1876.

These were evolved only about 20 years ago—just before the war. Compositions are now being made which will withstand ordinary corrosion for years, taking at the same time a beautiful polish. There are products which are unattacked by acids and others which resist heat at high temperatures with little loss of strength. While this evolution is in its infancy, its future is assured. Failures in given applications are getting the concentrated attention of American research laboratories and a perfected product is sure to be the result. The age-old problem of rust is facing solution.

The occasional references in THE IRON AGE, of 60 years ago, show that alloy steels were substantially non-existent. Steel makers and metallurgists were groping in the dark, dimly conscious that a little chromium or a little nickel changed the properties of iron, but how and why they did not know.

Then came the gradual changes demonstrated sketchily in this article. The evolution has been romantic and with it are associated some brilliant American metallurgists. Closely related to it and interdependent in promoting progress are the X-ray, the microscope, magnetic analysis, hardness testing and other instrumentalities of analysis.

The Future Based on the Past

THERE is a certain amount of pleasure in predicting, however foolhardy it may also be. In respect to the future, one would be safe in

stating that alloy steels have only commenced to find their usefulness and that other alloy combinations are sure to come. Already on the horizon there is the metal beryllium, about which enough is already known to warrant the statement that it confers some striking properties on certain steels. When it becomes cheaper, as it surely will, it will find a large place in industry.

Importance of Research

Great research organizations are very active and not a year passes that some new light is not thrown on a difficult problem or some new development is announced. There should also not be forgotten the fact that alloy steels include alloy steel castings and, in the broad sense, alloy iron castings also, in which fields advances of large importance are recognizable.

Readers of THE IRON AGE 75 years from now will turn back to the pages of today and will pay tribute to the workers in this notable period of monumental industrial laboratories, equipped to the last word in respect to instruments and apparatus, manned with the best brains that the spirit of investigation could encourage and dedicated to pure and fundamental research fully as much as to research bearing on the current problems of practical production, and all in a period of a few years. Surely the enthronement of research will prove to be of epoch-making importance.

LOOKING AHEAD WITH INDUSTRY

By GEORGE S. HERRICK

THOSE critics of our present industrial system who point out its deficiencies and maladjustments might benefit by studying the significance of the six septuagenarians depicted in the first painting in this number. The history of America shrinks into smaller compass when we measure its entirety by six overlapping lifespans. Civilization is not old, but young, when recorded history may be completely spanned by the lives of forty-four men.

Progress has been more rapid than we thought, when we visualize it in such terms. Industrial progress, most of it compressed into the last span of 75 years, has been an amazing miracle of accomplishment. Turn for a moment from the first painting to the last chart inserted in this number, "Milestones in a Lifetime of Progress." Consider, as you examine this necessarily incomplete record of inventions and discoveries, that all of these things were unknown when the present-day septuagenarian was born.



SEEKING to project ourselves into the next few decades of industrial progress, we are faced with the realization that other generations have been able to foresee but little, despite material evidence of the future on every side.

It was in 1876, the Centennial year, that *THE IRON AGE* undertook to suggest something of the future of industry a century later. And today, with little more than half that century passed, the speculation of that day appears quite inadequate. The most optimistic expectations and prophecies of future progress have always fallen far short of the actual record of accomplishment.

"The steam engine will still be doing the world's work," said the prophet of 1876. "Until coal is exhausted we shall not need and are not likely to have any other or better source of power; travel by

water can never be possible at speeds at all comparable with those now practicable on land; it is doubtful if 40 miles an hour will ever be attained on the water; in mechanics, few changes as radical as those of the past century are likely; travel will be on solid ground or in substantial ships; rates of speed will not greatly exceed the possibilities of the present, possibly 60 miles an hour by train, 30 miles an hour on ocean-going ships and 40 miles an hour on rivers; with prime-movers weighing less than 25 or 30 lb. per hp. the problem of aerial navigation will be easy of solution; the traveler of 1976 may cross the Continent or ocean in a flying machine."

Signs of Progress

And yet, when these words of prophecy were written, the Centennial had seen a demonstration of voice transmission over a wire; a calculating machine, forerunner of the complex business machines of today, was being exhibited; and the pages of *THE IRON AGE* had carried, or were to carry within the following few months, discussions of underground and elevated railroads, and tunnels under the East and Hudson Rivers at New York. The Brooklyn Bridge was being constructed, a bridge over Blackwell's

Island was being discussed and a Hudson River bridge 43 miles north of New York under consideration.

At this time, iron was entering into wide use in buildings, steam-driven street cars were providing transportation in American and European cities. Railroad cars were being built of iron experimentally, and steam was being used for the first time in heating passenger cars. A central steam plant for an entire town was being built in England, the foundations of our great daily commuting from suburb to city had been laid in flat-rate, low-priced transportation for labor into Boston. Electric illumination had been provided by the magneto-electric machine, installed on a merchant ship and a man-of-war, and, in certain progressive factories in Europe, the electric motor was being used in a limited way.

Oil had successfully heated a boiler in Italy, patents had been granted on an apparatus for transmitting facsimile telegrams in the sender's own handwriting, a measuring faucet for liquids was being manufactured, forerunner of the gasoline pump of today, a sprinkler system had been invented and the first machine gun was being tested by the Navy. Artificial ice was being made, and centrifugal fans and

air pumps offered the basis for future cooling systems, messages had been communicated between two kites 10 miles apart in the mountains of West Virginia, and mechanization of the farm had begun, with steam cultivators and portable steam engines.

Evidence of the industrial achievements of the twentieth century was available at almost every turn, and yet, only a fraction of the tremendous development of today was foreseen. The foundations of a new century were being laid, but the foundation builders could see the superstructure but faintly.

Cycles of Progress

As we peer forward into the next few decades a picture of tremendous possibilities presents itself. It has been suggested that material progress appears to travel in cycles, remarkable developments marking a few years, succeeded by an interregnum for consolidation and development. The record of the past 75 years indicates the appearance of such cycles, and manifestations in our industrial structure today suggest that we may again be on the threshold of new achievements, which will even surpass the progress of the nineteenth and early twentieth centuries.

Management, during the next decade, must and will solve the so-called employment problem, which arises from the temporary maladjustments between supply and demand, and which includes both depression unemployment and technological displacement. Both of these

phases of unemployment are at present overemphasized in the public mind, due to the psychology of depression. It is a repeated symptom which has accompanied depression periods for a full century. Our grandfathers worried about these things and talked about them in 1870.

Over the long-term period, employment, in proportion to population, has steadily increased, in spite of mechanization and the increased use of power, until today the employment factor is twice that of 1855. However, these periods of temporary unemployment constitute a social menace in the hardships that they impose upon the displaced, as well as a mental hazard to the employee. That this problem of adjustment will be solved is evidenced by the fact that it is now clearly recognized and accepted as a responsibility of industrial and public leadership. This is the first big step toward its solution.

Built on the evidence of today, and with these minor maladjustments corrected, the future looms like a mirage. It is conceivable that, within the next few decades, we may be traveling at speeds unbelievable today, in leviathans of the air that dwarf the giants of this era. On land we may travel over roads on steel foundations, through congested districts on overhead highways of structural steel, at speeds impossible in this day of traffic confusion, transported in motor cars with more powerful motors, the bodies designed to offer a minimum of resistance to the wind and

affording greater power efficiency. On our railroads, greater speeds than are now attained appear probable.

We may transact our business in all-steel buildings, on the roofs of which aircraft lands and departs, returning by air over metal roads to our homes, constructed wholly or partly of steel. Labor-saving devices in our homes, offices and factories will have multiplied, and electricity will daily perform miracles now confined to the great laboratories. Noise will have been minimized and what remains will be successfully excluded from our buildings.

In the less congested districts, factories of steel and glass will permit maximum operating efficiency in scientifically washed and regulated air. In the congested manufacturing areas, windowless factories illuminated with science's substitute for sunlight will house much of the country's production. The farm problem may have been solved by great agricultural corporations, completely equipped with the necessary machinery for scientific farming—operating laboratories, employing labor, just as other large industries.



DURING the memory of many men now living, there has occurred the most remarkable transformation in living and working that mankind has ever experienced. A thousand years of progress, measured by previous accomplishments, have been compressed into one lifetime.

Considering this veritable revolution in means and methods, this amazing awakening of mankind to the possibilities of power, machinery and coordinated mass effort, the wonder is not that there should be deficiencies and maladjustments here and there, but that the social fabric should have been sufficiently strong and adaptable to withstand, so admirably, the rapid and mighty play of these newly-liberated giant forces. We have built a functioning machine; the adjustment and smoothing of its parts comprise a minor task compared with that accomplishment.

Based upon the progress of the past three-quarters of a century, the future becomes illuminated with the hope of still greater progress.



Some of the wildest dreams of the romanticists seem not improbable, under the miracle-working power of modern scientific research. As an illustration, consider the magic carpet of the Arabian Nights. One had merely to wish to be at some place thousands of miles away, and presto, it was accomplished.

Modern developments in radio and television are bringing the magic carpet out of the realm of imaginary legend and into the realm of every-day living. These developments promise practically to annihilate terrestrial space for two of man's five senses: sight and hearing. A few more steps of this kind and translation will be achieved, so that one in New York may wish himself in Bagdad, and instantly be there so far as his perceptions are concerned.

Evidence of all this is at hand, not in the imagination of impractical dreamers, but in actual developments of today. It is conceivable that we are now, in this moment of depression in the long history of industrial progress, pausing but a moment by the wayside. "Our world is advancing and we shall move with it. We cannot escape progress," says Charles M. Schwab. And this progress has been written and will continue to be written in terms of steel and its alloys, and alloys of other metals, translated into practical applications by the metal worker.

The Future in Today's Events

But what of this evidence of a new era of industrial progress? What proof have we that the future will be much different from the present? Evidence accumulates every day and current achievements and efforts serve to develop this picture of the future.

In Germany, the leading aircraft manufacturer is constructing an airplane, which has become known as the "stratosphere" plane, intended to rise 35,000 ft. and attain a speed of about 500 miles an hour

in the rarefied atmosphere of that altitude. In the future, Berlin and New York may be but six to seven hours apart. While first attempts at traveling through the upper atmosphere may meet with failure, such craft and such speeds are potentialities. A great 135-passenger airplane has made successful trial flights in Switzerland and is planning at this writing to cross the Atlantic.

Within the past month, auto-gyro planes have demonstrated their capability over New York, and progress is being made toward planes which can land upon and depart from the roofs of buildings, promising revision of our present architecture from spires to flat landing spaces. From the flimsy wood and fabric airplane of the Wright brothers we are moving forward into the all-metal leviathan of the air, with frame of alloy steel, fuselage and wings of metal. With cost of production a growing factor, the use of steel in aircraft of the future promises to increase steadily.

Materials Handling and Mass Production

During the last third of the three-quarter century that we have to do with in this number has come the greater part of the building up of what is called "mass production." This, in turn, has been largely dependent upon the development of industrial electricity and of materials handling. The former has provided the flexibility of powering and the possibility of increasing the power factor per man in industry, as required, almost without limit. The latter, materials handling, has raised industrial lifting and carrying into the same plane of efficiency as the purely productive operations, thus immeasurably increasing the over-all efficiencies of our plants and their processes.

Both of these mighty industrial factors are yet to exert the maximum of their effects in industry. We shall see, during the next decade or two, wonderful advances in their methods and mechanisms, and in their adjustment and correlation to the other factors of industrial activity.

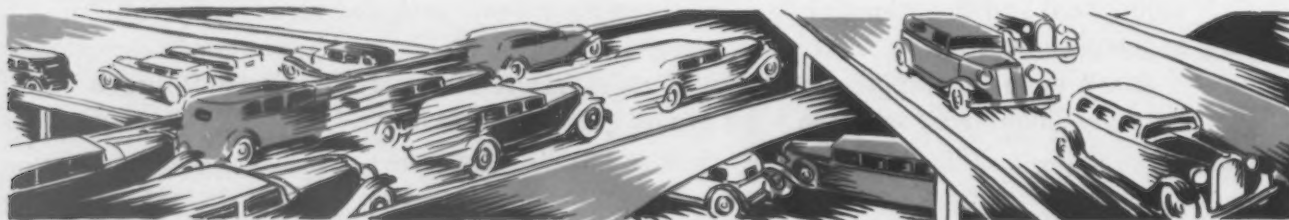
Mass production, which in its in-

ception embodied a rigid and long term, standardization, is freeing itself from this conception. The automotive industry, in its trend toward frequent style and model changes, is largely responsible for this movement. It has been found possible to reconcile the mass-production idea with the idea of more or less rapid product evolution. This same influence is at work on the automatic and semi-automatic production machine. One of the strong trends which will have its effect in the coming decade is this movement toward the achievement of flexibility.

It is in building construction, however, more than in other fields that we see the future reflected in the trends of today. Here we are departing from the customs and usages of the past. The whip-socket built into early automobiles having long since been cast into the discard, the architect and engineer are meeting new conditions with new designs and with metals.

Exclusive of almost 5,000,000 tons of structural material, it is estimated that some 200,000 tons of flat rolled steel is now used annually in building, and it is suggested that a potential market of 1,500,000 tons a year offers itself to the producer. Our modern business structures and public buildings present us with steel at every turn: doors, window frames, shafts for interior ventilation, baseboards and windowsills, ceilings, even paneling of rooms. Today the metal worker needs almost 250,000 tons of flat rolled steel annually for the creation of office and home furniture, and wood furniture is still widely in use.

But the story of steel in buildings is by no means completed. Architects and engineers are already planning to wipe out the final vestiges of another age. The day of seeking to reproduce in cast iron the stone carving of the past has long since passed, but the masonry wall remains. Almost overnight, however, it may disappear, with metal persistently pushing forward to replace it. The metal spandrel has been adopted, an example of its extensive use being the Koppers Building in Pittsburgh; the wide metal mullion between windows ap-



appears in chrome-nickel alloy steel in the new Empire State Building in New York; and the rustless steel spire of the Chrysler Building seems to project itself into a future of all-metal buildings. The metal-faced building, sheathed with rustless steel or vitreous enameled sheets, presents the spectacle of a brilliant and colorful city of the future.

In Chicago, a metal-faced apartment house is being planned, the insulated metal wall of the building being only 3½ in. thick, instead of the usual wall of about 14 in. This thin wall is claimed to be equivalent in insulation value to a 36-in. wall of brick. Battledock floor construction will be used, a development of the past two years, the floor consisting of steel plates welded together and to the building frame. The use of this type of flooring in buildings is suggested to save ceiling height, permitting an additional story in every 10 or 12 stories, compared with ordinary floors. An all-metal building, 1000 ft. long and 145 ft. wide, is being constructed for the Chicago World's Fair. Revision of the New York building code is planned, to permit metal-faced as well as masonry-walled structures.

Windowless Buildings Are Coming

Our great, modern, architectural triumphs may be superseded in the next few decades by structures far different. Buildings are being constructed today that point to steel and glass, and to the abandonment of windows entirely. The great Travel and Transportation Building at the Chicago World's Fair will be without windows. An industrial application of the windowless building appears in a new factory for the Simonds Saw & Steel Co., Fitchburg, Mass., which will be artificially lighted and furnished with interior ventilation. In such structures we are perhaps viewing the city dwelling and factory of the future. The trend in steel and glass buildings is embodied in a structure for the Worcester Pressed Steel Co. in Worcester, Mass., and in the new transformer building being constructed at Pittsfield, Mass., by the General Electric Co.

Buildings are not alone in promising a great use of steel during the coming decades. In Sangamon County, Ill., a short section of experimental roadway promises to provide at least a partial solution to the problem of highways that will resist the destructive effect of twentieth-century motor traffic. The surfacing in this case is brick, laid on a foundation of heavy iron sheets. Success of the present experiments may lead to the wide use of steel or iron, with various surfacing applied, such as concrete, asphalt or rubber. In fact, the rubber-surfaced highway appears nearer to realization, with the rubber growers passing through an acute period of overproduction and seeking a new outlet at lower prices than ever before possible. With the rubber highway, the rigid steel base might not prove necessary.

Overhead Highways in Congested Districts

The steel industry is still seeking new fields. While the metal-faced building and the steel highway offer the greatest possible new outlets for a super-production of flat-rolled steel, afforded by the coming of continuous production of sheets, there are many other uses promising considerable tonnages of steel.

We are a rapidly moving people today, aided by the motor car. But the concentration of population in cities and the restless movement has brought problems undreamed of by an earlier generation, which believed it, too, had a traffic problem, with horse-drawn vehicles preempting the streets. "Undoubtedly, the next decade will see the accomplishment of rapid changes in the methods of handling traffic" says a prominent automotive executive. "Overhead express highways, the elimination of grade crossings and a more comprehensive solution of the parking problem to permit the full street capacity for moving vehicles will tend to a more accelerated movement of vehicular traffic, and allow the more general use of the reserve power of the modern motor car."

The next few decades of industrial progress shows us a panorama of overhead highways stretching

through and out of our cities; not the possibilities of a distant future, but the actualities of today. New York has

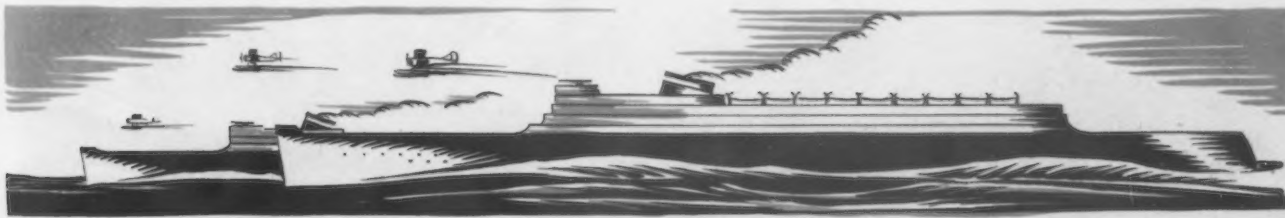


partly completed its West Side vehicular highway, which will require in all upward of 50,000 tons of structural steel for less than three miles. Near Newark, N. J., another great highway for motor traffic is planned, and a 15-mile highway from Detroit to Pontiac, Mich., is beyond the formative stage. If these early vehicular highways serve to alleviate the problem of traffic, as they promise to do, the overhead highway will become a part of the familiar scene in the future city and its environs.

Added to the heavy tonnage uses of steel are many future requirements which will cumulatively bring a substantial total to the steel mill and the metal worker. Much of the increased use of metal has been brought about by the pressure of population, the demand of hundreds of thousands to occupy areas formerly considered sufficient only for a minor population. This trend is continuing as we grow industrially, and steel continues as one of the most desirable of materials to be used in meeting new problems.

Steel Gutters to Replace Pipe Galleries

Except for the main arteries, the streets of our cities in the past could be excavated with little inconvenience except to the immediate residents. Repairs to gas and water mains, electric and telephone cables, could be made and the street then repaved. But with more pipes and cables carried under the streets, and traffic increasing rapidly on the surface, excavation became a serious problem, so that pipe galleries were built into the more heavily traveled thoroughfares. Most of the streets of our cities today, however, must still be excavated from time to time, as repairs and maintenance are necessary, and traffic in cities has become a problem on the side street as well as the main thoroughfare.

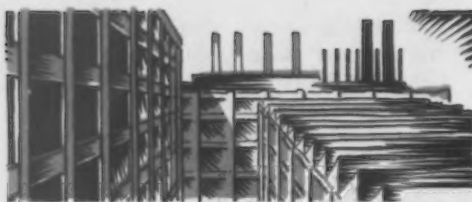


To meet this newer condition, combination metal curbing and gutter has been suggested for city streets, the sections of the gutter being removable for repair of pipes and cables underneath, so that excavation and consequent interference with traffic would be unnecessary. With steel adopted for such a new use, thousands of miles of city thoroughfares open in prospect to the sales and merchandizing ability of the steel producer and the metal fabricator. "Our job in the steel industry is to push forward," says Charles M. Schwab, "adding to our progressive policies in employment and management an equal intelligence in marketing and the extension of the uses of steel."

Steel railroad ties, in large use in Europe, offer possibilities for the American steel industry. Economic factors cannot be disregarded, and the railroads today are definitely waiting "to be shown." But the tonnage is there when the cost, on large-scale production, can be made to compete successfully with the creosoted wooden tie.

Whether the "cold" feel of steel furniture can be overcome is for the future to say. That appears to be the one deterrent to the wider introduction of steel into household furniture. If one's bureau is to have a glass top, as many of them have, then the "cold" argument disappears, for glass feels as cold as steel. But for chairs and beds and other pieces the objection will have to be overcome or circumvented. And here, as in steel for houses, the designer will probably have to depart from mere copying of what has been done in wood. Designs peculiarly suited to the steel are called for, and many of these have already been supplied.

Incursion of other materials into the field long held by steel is a matter which will have to be faced in some degree. Aluminum alloys have been making a deserved place for themselves in our new scheme of things. In so doing they have in some cases displaced steel. They are much lighter and, where this is a paramount consideration, they will make their way. Some of these alloys have the strength of the com-



moner steels which they have displaced. Here it is a case, as in many other instances, of selecting that material which will best perform the required service. Where economic considerations enter, steel will usually be found holding its own. Thus we shall have to strike a nice balance, in which weight, unit cost, strength, durability, appearance and many other factors will be involved.

Small new uses of steel are innumerable. As a means of waterproofing, steel has been found a desirable material for the outside wall of concrete foundations where the ground is damp, and water tends to seep through. Recently an engineer on dams proposed the use of steel to cover the underwater apron of a dam, as a means of preventing seepage while the concrete is drying. We are entering into a new era of canalization and inland river development, and the new vessels are steel, passing canal embankments often held in place by steel instead of wood. The next decade promises further advances in the great development of the lower Mississippi, Missouri and Ohio Rivers, and steel will be an important factor.

When we consider these new uses to which steel will more than likely be applied in the near future, viewing them against the background of the accepted uses of today, when we consider that many of the ships now in use must be replaced, in the next decade, with larger and faster vessels, that the modern structural steel buildings of our cities are still in the minority, that mechanization of agriculture has only begun and the transmission of electricity over high-tension lines and the movement of oil, gasoline and natural gas through hundreds of miles of steel pipe is but the development of recent years, that greater tunnels and bridges than in the past will

be required, an estimate that ten years hence the steel consumption of the country may exceed 65,000,000 tons of ingots annually does not appear exaggerated.

Not only will the steel manufacturer in the next few decades seek extended uses for his products, but closer cooperation with the consumer, the metal-working industry. This appears a probable development, as together they seek new and wider markets and better materials for specific uses. Demand for many products into which steel enters largely can be created in vast areas in the United States, sections which are growing and using more machinery per capita than before.

Future Markets in the South

In the South, migration of the negro worker to other sections and his replacement by white labor is rapidly advancing the buying power of the people. More than a million negro workers have left the South since the World War, according to the survey of the economic status of the negro recently made at the suggestion of President Hoover.

In the past 40 years the ratio between agriculture and industry in the Southern States has been practically reversed, although both have prospered and progressed. As a result of moving the Southern worker from the farm to the factory, and the reduction of the negro population, whose incomes bring down the general average, conservative estimates are that purchasing power in the South has more than doubled in the last decade. But continued improvement in buying power is by no means ended, and it is expected to double again in the next 10 years.

Growing concentration of the population in industrial centers of the South will create demand for multi-family dwellings using steel, increasingly better highways and other developments, already an important part of many Southern cities. Here lies a great market of the future, for the products being made today and the uses to which metal will be applied tomorrow.

Farm Corporations Possible

The middle, south and northwest areas of the country with an agricul-





...1880...

✦ The prophetic shadows of the coming of the great Electrical Era go back to Franklin, Volta and Ampere. But the giant, Electricity, waited a century after projecting his shadow upon the chosen few before enlisting his stupendous power in the practical service of mankind. ✦ After this long period of preparation, it is astonishing how suddenly the



oming of the
lin, Volta and
ted a century
e chosen few
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e long period
suddenly the

practical application of Electricity began in the
fields of power, light, transportation and commu-
nication. Here in this picture we see one of the
first dynamos, the first incandescent lamp, the first
central station, the first telephone exchange and
the first electric street railway. All of these came
within a three year period centering upon 1880.



tural future promise a smaller market in supplying the highly manufactured products required by the individual, but an enormous market for farm machinery and farm implements.

Here the solution of the farm problem suggests itself as great farming corporations, employing labor, operated as any other industry. Prof. William E. Dodd, of the University of Chicago, suggests that there may be "great wheat growers, cotton planters and stock raisers; or these may organize into great farm corporations."

Such a change in the status of the farmer appears more plausible viewed in the light of the Russian movement under the so-called Five-Year Plan of organizing the smaller farmers into large "cooperatives" and operating State-owned farms.

The Bessemer Ship Performs Well

AN eyewitness of the test run by the Bessemer channel steamer says in *THE IRON AGE* of April 1, 1875: "I may say at once that whatever other qualities the 'Bessemer' may possess, she certainly proved herself throughout the night most remarkable for the almost total absence of pitching, and for the ease and moderation of her rolling. No doubt, as regards the pitching, something is due to her great length—some 350 feet—but this I cannot suppose is sufficient alone, to account for the extraordinary steadiness which the Bessemer exhibits in this respect.

"Your readers will be desirous of learning what experience we had with the suspended Bessemer saloon, and with the hydraulic machinery for working it. Part of this machinery was still in some minor respects incomplete; but in the course of this morning the lashings of this large and heavy structure were cast off, and it was taken charge of by the Bessemer apparatus, which worked it for the space of an hour or two, with a heavy beam sea still running. It was very satisfactory to find that this apparatus appeared to have full command over the saloon, and was capable of oscillating it easily in either direction at the will of the manipulator. The manipulation was effected by a man holding a short lever in each hand, and moving them as nearly as he

In the United States the farm corporation might conceivably be the alternative—corporations with laboratories, chemists and trained agriculturists, and employing skilled and common labor. The use of modern machinery and equipment wherever possible would be a natural corollary. And to keep the worker on the farm, modern dwellings, entertainment after work and other activities thoroughly familiar to the forward-looking industries of today would follow.

Future Rich in Promise

Our industrial progress has been tremendous over the past 75 years, but the future is rich with promise. In the past the designer, the metallurgist, the metal producer, the engineer and the fabricator were looked to for progressive development. And they have done their

work well. But there is no reason to believe that they have reached the limit of accomplishment. There is every reason to expect that future progress will be commensurate with the past.

Two great accomplishments stand out in the pattern of progress that the milestones of progress make in the record of a lifetime. Industry during this period has built most of the tools with which ideas are transformed into realities, and Research has vastly multiplied the fecundity of invention.

No man can successfully dispute these two truths. How, then, can one look forward to the future except with hope and expectation of increased progress, in view of an accelerated flow of ideas, and our possession of the means of transforming them quickly and efficiently into concrete realities?

could in accordance with the oscillations of the ship, and it can scarcely be doubted by those who saw the operation that with a little practice the desired object will be fully accomplished."



The Pig Iron Mine Not of Recent Origin

PERHAPS the story of the man who bought stock in a pig iron mine is one of the alleged seven original anecdotes. As early as 1876 we find *THE IRON AGE* humorously commenting in the March 30 issue on the "king-bee" of iron ore discoverers, who has "gone beyond pig iron" and at last has discovered ore with steel in it. According to a quotation from the *Reading Times* "A rich vein of iron ore is reported to have been recently discovered in the lower end of Robeson township, which is said to yield ore of a superior quality, containing a great amount of steel." The joy that filled the soul of the discoverer of this vein of steel, says *THE IRON AGE*, must have equaled Keeley's when he perfected his motor.



The Electric Clock In Fancy and In Fact FORESEEN

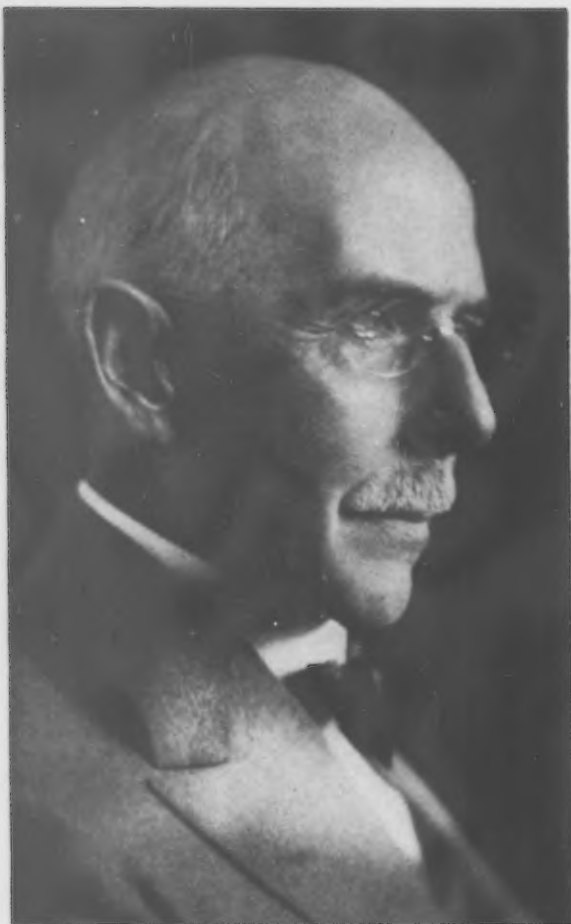
"A BOSTON journal makes the following extraordinary suggestion," says *THE IRON AGE* on March 13, 1873: "Town clocks are not noted for unanimity and in a large city it is difficult to find two alike.

"Both the expense and uncertainty of time could be avoided by the use of electricity. One small clock could move the hands of a hundred dials scattered over miles of territory or in fact over a whole State. Nothing would be needed in the towers but the dials, the hands and some machinery to move them under the electric influence from the central clock."

TWO YEARS LATER

Mr. R. S. Symington, telegraph engineer, to the Scottish Telegraph Construction Co., Glasgow, has just applied to the Clydesdale bank an electro-magnetic clock, understood to be the invention of Prof. Wheatstone, but the principle of which was first announced by Prof. Faraday.

This ingenious and interesting piece of mechanism, although not indicating "the time of day" by any index of its own, is so arranged as to control the movements of any number of connected clocks by means of magnetic currents.—*THE IRON AGE*, July 1, 1875.



After directing the destinies of THE IRON AGE through an eventful third of its life, Mr. Findley, now editor-emeritus and at present sojourning in Florida, gives us here, from the vantage point of widened observation, the special editorial of this anniversary issue. He has touched at some length on IRON AGE achievements that are the foundations for continuing developments of large moment to industry.

INDUSTRY WILL

JUST AS MANUFACTURING IS PROFIT-
ING FROM RESEARCH, SO WILL DISTRI-
BUTION GET THE AID OF SCIENTIFIC
TREATMENT

by

A. J. Findley

TWENTY-FIVE years ago when I came to THE IRON AGE work was well under way on an issue that was to mark the 50th anniversary of the founding of this journal. Following the traditions of such celebrations, that number gave many pages to the history of the publication—its early days in the little print shop at Middletown, N. Y.; the aims of John Williams, its founder, and of his son and successor, David Williams, who controlled its destinies for a half century; its development in a typically American way to the place of primacy in industrial journalism; the men and the policies responsible for its success; the physical equipment and the organization then required by its extraordinary service to a great industry.

As I read a few weeks ago the announcement of what was planned for this 75th Anniversary Number, I realized that the quarter century following that semi-centennial had brought no less a revolution in industrial journalism than in industry itself.

"Make no mistake," says the publisher's preview, "this is not to be a historical number." That statement seemed at first to be leading up to another and a familiar one, namely, that we are in a new era and history no longer counts. But the announcement did

not say that. What came next was, "We look back only to see ahead. . . . We have enough points on the curve of past progress to enable us confidently to project it forward."

Whereas the makers of the anniversary issue of 25 years ago regarded its pages of history as much worth while in themselves—most of them at that being the story of THE IRON AGE itself—the editorial view of today is quite different. In short, it is that this Diamond Anniversary Number finds a reason for being in so far as it makes the progress line of 75 years of the American metal-working industry a finger-board to the situations which that industry will meet in the years just ahead.

That attitude is only in line with what is the chief imperative in every field of activity today. Not what his business was ten years ago, or even what it is today, but what present policies will make it five years, ten years from today is the paramount concern of the industrial executive. And history takes on value in proportion to its convertibility into prophecy. I congratulate those responsible for this issue on the outcome of their decision to make it inspirational and prophetic.

For 50 years David Williams was sole owner of

OPERATE MARKET LABORATORIES

THE IRON AGE, but only in the early part of that period was he its editor. He used to say of his withdrawal from editorial labors that he had found it more and more the case that the work of other men which suited him was better than his own work that suited him. In announcing, back in the early days, that he had purchased the property from his father, he declared his purpose "to produce a journal that will have the quality of an essential utility to its industry." To his success in realizing that ideal the number, high character and loyalty of his thousands of readers gave cumulative testimony for decade upon decade. His contemporaries in the field of industrial publishing freely recognized the leadership of THE IRON AGE.

Becomes Purely an Industrial Paper

IN the fall of 1909 a group of business publishers purchased THE IRON AGE and other publications of the David Williams Co. One of their first decisions was to make a separate paper of what had long been the hardware department of THE IRON AGE, and the wisdom of that step has been continuously demonstrated in the vigorous career of the *Hardware Age* and the high place it has held in the esteem of the retail hardwaremen of the country. More than once before the change in ownership the proposal to make this severance of the merchandising section of THE IRON AGE had been under consideration. While Mr. Williams recognized that iron and steel and machinery manufacture had grown into commanding industries since the founding of the paper and that the thinking of the hardware dealer had little in common with that of the industrial executive, he could not forget that in its early days THE IRON AGE had been known as the *Hardwareman's Newspaper*. He had so long made good on his claim that his publication covered the entire field from the ore in the ground to the passing of the final product over the hardware counter to the ultimate consumer that the making of two journals out of the one would be, as he put it, like separating the Siamese twins.

But the new owners did not share Mr. Williams's fear of the consequences of that operation. They judged rightly that their expectations for a new and greater IRON AGE could be realized only as it became purely an industrial paper. Those to whom they gave over its editorial direction saw, too, that the time was fully ripe for an expansion of its activities to the point of making it serve with all its accumulated power the whole army of American makers and users of the world's basic metals.

They saw that the steel and allied industries had

come to a new stage in their development; that they were entering upon an era in which the producers and the manufacturing consumers of steel would have more common interests; that market developments and technical progress in the vast metal-working field would call for a journal of larger scope and correspondingly expanding enterprise.

New Demands of Post-War Period

THE 20 years of the latter-day IRON AGE have seen a rapid evolution in the foundry, machine tool, steel construction, automobile and every other major section of metal working. Along with the spur given to technical progress has come a procession of changes in all industry, in methods of production and distribution, in the relations of government to business, and in the bearing of old-world problems on our national economy. For the past 12 of the 20 years the destinies of the industries represented by THE IRON AGE have been shaped in large degree by the consequences of the World War.

The American war effort brought so many new contacts and such cooperation in all departments of the steel-making and steel-consuming industries that our manufacturers naturally sought to perpetuate the obvious benefits of group action. As a result, the post-war years have been marked by the rise of one new association after another, technical or commercial, in the metal and machinery trades. This movement THE IRON AGE has advocated and furthered as not in the selfish interest of one or another section of its field, but as tending to sounder practices, more en-

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MR. FINDLEY'S critical outline is a picture that tells how through all the years THE IRON AGE has wielded a constructive influence of first magnitude, how it has been an essential instrument in the upbuilding of the engineering industries and in what particulars it has aided in shaping what he foresees as among the next noteworthy industrial developments,—the provision of market laboratories.

He has singled out from the long chain of interesting facts that go to make up the history of this journal those activities that have made for its stability and dependability in the past and provide the basis for the work of the future. Readers will appreciate this setting down of the part the business paper has played in the march of industry.

▼ ▼ ▼



lightened competition and more perfect understanding of the demands of the new alignment. Events have borne in upon manufacturers in every department of metal working that it takes much more of a man to win success under present-day conditions than

it took before the Armistice. Never did the executive need to know so much about so many phases of his business. The meeting of that need has been the prime aim of the 20th century IRON AGE.

Increased Need of Broadened Journal

IN the earlier years of the new century industrial journalism seemed to be heading into narrower specialization. Operating men read publications devoted to their own technique. Markets and finance and the major problems of management and human relations were little in their thought. But the consolidation movement, the new systems of wage payment, the high-speed steel revolution and all the reorganization that has come with mass production have changed the reading of the operating staff as they have changed that of every responsible man in the four departments of modern industry. Production, distribution, financing and purchasing are so inter-related today that the forward-looking man in any one of them must know as never before what is going on in the others.

In meeting this new-era demand, and with it the demands of the group effort that has been so important a factor in the post-war period, the editors of THE IRON AGE have steadily broadened its scope. This has meant a larger staff, a larger contributor list and a material increase in the amount of reading matter.

The growth in technical and trade associations alluded to above has more than doubled in the 20 years the number of conventions of which our readers have learned to look to THE IRON AGE for reports, some of which amount to a real epitome of the latest practice in a given field. Probably 30 such reports now appear in a twelve-month, as against no more than a dozen 20 years ago. The American Society for Steel Treating, a stripling 10 years back, is today, with nearly 6000 members, a phenomenon of rapid growth among technical societies. The Machine Tool Builders' Association wields an influence far beyond any thought of its founders. In the fabricating field the American Institute of Steel Construction has well earned distinction by reducing building costs through standardized practice and by combining legitimate cooperation with legitimate competition. Among others, organizations of gear manufacturers, crane manufacturers, producers of gray iron castings, the malleable castings industry, the steel founders, flat rolled steel companies, forge shops, pressed metal plants, welding interests, builders of conveying equipment, makers of bolts, nuts and rivets, have come to the fore in the last decade, and the three pioneer foundry and metal trades associations have shown surprising renewals of youth and vigor.

Epic Story of Pig Iron Statistical Service

IN the two decades of the new IRON AGE its statistical work has been one of its conspicuous services. The gathering of monthly statistics of pig iron pro-

duction was begun in October, 1901, and these reports have long been accepted as an index of conditions not only in iron and steel but in all domestic industry. In this day of data in abundance to help the manufacturer to chart his course, the difficulties of the pioneer trade statistician are little appreciated. It took time to assure the secretive blast furnaceman that the amount of his output would be held in strictest confidence and that only district totals would be published.

Some years ago a Central Western group of blast furnace owners notified this journal that they had decided that too much information on pig iron production was open to the buyer and therefore they would cease sending monthly reports. Some 15 or 20 furnaces were represented in the group. In view of the wide dependence on the pig iron figures, THE IRON AGE continued to print them, being able to check closely the operations of non-reporting furnaces. In a year or two most of the withholding companies were persuaded to resume reporting.

Today these monthly figures represent 100 per cent of producing capacity. And whereas their compilation once required a week, or even 10 days, they are now commonly printed on the first day of the month—at times on the last day of the statistical month—all figures being telegraphed and the final 24-hour output being estimated. Such promptness in the publishing of barometric trade information has no parallel.

Pioneer in Steel Output and Distribution Statistics

MORE than 20 years ago, when it was evident that very soon the output of steel ingots would pass that of pig iron, THE IRON AGE sought to secure monthly statistics of ingot production. However, the then president of the Steel Corporation declined to furnish its ingot production, even for incorporation in a total. At the same time this executive expressed the opinion that too much information was already given to buyers of steel, referring particularly to the monthly reports of the Steel Corporation's unfilled orders.

Some years later the request for monthly steel ingot figures was renewed. By that time the producers were persuaded that the American Iron and Steel Institute, which previously had gathered steel statistics annually, might well undertake a monthly compilation for ingots, and since June, 1917, these monthly statistics have come from that source.

The genesis of the "Where Steel Went" exhibit, which has been a feature of each Annual Review Number of THE IRON AGE for the past nine years, was an editorial in our issue of Oct. 6, 1921, under the title "Need of a Survey in Steel." It pointed out that there was a notable lack of exact knowledge in the steel industry concerning the outlets for its product. The concentration of the country for three years on steel production for war purposes had put all past reckonings of steel consumption

channels out of joint and it was certain that post-war readjustments would make many changes in lines of distribution. The percentage of the total taken by railroads had long been put all the way from 20 to 40 per cent and



was commonly exaggerated. The article urged that the American Iron and Steel Institute might well undertake a survey which would show approximately the tonnages which had gone into the main lines of consumption in the recent past and at the same time indicate in what directions, new and old, propaganda work should be carried on to extend the uses of steel.

Following the publication of this editorial THE IRON AGE offered to cooperate with the Institute in any effort it might make to secure the desired information. About that time, however, the Institute's secretary resigned, the choice of a successor was delayed for several months, and the proposal to make this important departure in its statistical work was held in abeyance. When Mr. Clarke became secretary he made a thorough study of the subject and recommended a classification and a method of reporting by steel company sales departments which would enable the Institute to make a close approach to accurate distribution figures. The directors, however, decided that the system would involve the continuous earmarking of all orders for finished steel throughout the year and this would entail a prohibitive expense.

The time should not be far off when the Institute will regard such an accurate chart of the steel industry's market as worth all that it would cost. Meanwhile at the end of each year most of the steel companies furnish for publication estimates (some made with more and some with less care) of the tonnages shipped in various channels of consumption in the twelve months. While much can yet be done to add to the value of this exhibit, the statistical department of THE IRON AGE finds satisfaction in the wide acceptance of its preliminary figures of steel production and steel consumption as given in its Annual Review Number. For 1922 the "All Other" column in our classification of steel uses was 28 per cent of the total, much of this 28 per cent being in fact not steel used in "other" lines than railroad, construction, automobiles and the rest of the scheduled outlets, but simply steel that belonged in one of these classes but was not traceable to its class. By dint of the closer study THE IRON AGE has made year after year the 28 per cent of "All Other" carried in its chart for 1922 was materially reduced in recent years, for one twelve-month being as low as 16. Recognition of this performance has not been lacking, leading companies in the industry using the compilation of this paper in planning for the year just ahead, in the light of the share they have had in the steel output of the one just ending. In former times months of the new year had passed before any such information could be had.

Vicissitudes of Market Reporting

IN a day when market research is being capitalized as never before, it is hard to believe that the steel industry will not increasingly cooperate in this effort to eliminate haphazard and make a nearer approach to budget control of operations.

While the marvelous technical advance of American steel-making is a well-worn theme of anniversary occasions, not so much has been written about the marketing of steel products or of the place of market reporting in the modern



mechanism of steel distribution and valuation. THE IRON AGE was the first journal to report market transactions in iron and steel. Attempts had been made in New York to establish a metal exchange, but nothing more than a perfunctory routine of bid and



asked prices ever resulted. While iron and steel prices have been quoted in the columns of THE IRON AGE from the beginning, the first attempts at regular market reviewing date back to the eighteen-seventies.

It can be understood that facts relating to transactions between buyer and seller were not readily got at 50 years ago. Some in the trade refused to give any information that would aid in establishing quotations. But as time went on the great service the paper was giving in setting up a clearing house for iron and steel values began to be appreciated, and for some years now the race of those who would give the market the "protection" of secrecy has been practically extinct. Today the function of the impartial market review, the work of careful and experienced investigators, who have more than surface channels of information, is appreciated as never before.

IT is no easy road THE IRON AGE has traveled, since its market quotations acquired an acceptance that made them the basis of settlements on hundreds of thousands of tons of pig iron and finished steel products every year. Going back in our files, I find in one issue two letters, received in the same week, one from a buyer of pig iron and the other from a seller. The seller complained that THE IRON AGE "frequently leaned to the bearish side, when the conditions as to the cost of material, labor, etc., should have led you to try and stiffen the market for the sake of the producers." The buyer wrote, on the other hand, that he made heavy purchases of pig iron, but did not report them and knew that the furnaces would not, "since they were below the market you and other trade papers try to establish." It need not be said that THE IRON AGE took issue with each of its correspondents, both as to its alleged duty to the producer and as to ever attempting to establish a quotation.

In the Government's suit to dissolve the Steel Corporation and in the historic Pittsburgh basing case before the Federal Trade Commission, the methods of obtaining the facts about steel prices came in for review, and the wide acceptance of THE IRON AGE's quotations was a pivotal point in both. Yet in the periods covered by these inquiries there were widely varying degrees of difficulty in correctly appraising the market. In times of sustained demand published quotations were rarely challenged. When demand faltered and sales effort had to be more aggressive, the capture of business without price concessions grew harder. Then came the regular semi-annual preaching of Judge Gary from the presidential rostrum of the American Iron and Steel Institute. But eventually a lower price was made, and then it was "met," yet with no intention of affecting the "regular" market. And thereupon the cutting of the price was far less heinous in the eyes of some producers than the act of the market reporter in giving publicity to the cut. Generally speaking, sellers of steel have a more appreciative sense today than ever of the obligation

of the market reviewer to report the situation as he finds it, without bias or favor; yet there are still a few among them who seem to believe that a market paper should give no publicity to a downward price change until it is no longer news and the length and breadth of the trade knows all about it.

Future Calls for Continued Impartiality

SEEING that the purpose of this issue of THE IRON AGE is more forward looking than backward looking, the future functioning of the paper in market reviewing comes up. In the next 20 years will the successors of Gary, Schwab and Farrell as mentors of the steel producers sound the same warnings against price cutting that have marked the last 20 years of Steel Institute meetings? If the number and line-up of producing companies are changed in no greater degree than in the past 20 years there can be little question of the continued demand for impartial market reporting. While for some years 75 per cent of the country's steel capacity has been in the hands of but six corporations, fluctuations in price curves have been many, even though not of wide swing. Competition promises still to be such as to give to iron and steel market reviews what David Williams described as "the quality of an indispensable utility" to buyers and sellers.

Further concentration of the industry has been long in the air, but mergers are beset with increasing difficulty. Rivalry such as the six months of court hearings in northern Ohio have intensified may have hurtful consequences; and there is also the problem of competent leadership for huge corporations, as well as the attitude of the public toward further engrossment of a highly essential industry. It is likely, therefore, that any great further gain in the prevention of unprofitable selling must be sought in ways other than mergers.

Something was said above of a new era in the relations of the producers and the manufacturing consumers of steel, an era which was opening at just about the time THE IRON AGE was made a purely industrial paper. It has been marked by a degree of cooperation and appreciation of their common interests that was not known before. Time was when the producer's attitude toward the buyer was, in effect: This is the steel we make and this is the steel you need. That is all changed today. In the early nineteen hundreds steel makers and railroads were in bitter controversy over the quality of rail steel. The urge for tonnage records at mills was blamed by the railroads for much of the trouble. Like criticism came at times from engineers who sought more exacting standards for steel going into construction and power uses.

But the period of combat has given way to one in which research men, engineers and executives of both buyers and sellers are cooperating for the production of steels capable of meeting increasingly severe demands. Side by side with even greater mill outputs in the high-tonnage products has gone the development of quality steels that would withstand greater pressures and higher temperatures or give greater resistance to wear or corrosion. From at one time being on the defensive, taking the position that the

buyer of rails, for example, would get better results if only he would order heavy enough sections, steel producers in these later years have gone in heavily for research and for advanced practice, so that any call of the buyer for higher quality steel might be met. The pages of THE IRON AGE have given constant evidence that this movement has had no parallel in any equal period.

Market Laboratories, the Coming Development

FOR the next decade all signs indicate that progress on the distribution problems of the industry will be for the first time comparable with the mechanical and metallurgical advance in steel production. As has been often urged in these columns, market laboratories have fully as large possibilities of return to the producer of steel as any that have been laid down with such lavish outlay for chemist and physicist. Steel capacity is and has been in excess of steel consumption. Today it is 75 per cent greater than in 1913. New outlets must be found and old uses extended.

Mr. Schwab told his fellow manufacturers at an Institute meeting in 1928 that extension of their markets should be taken up as their immediate and engrossing task. Later the Steel Corporation, which has so signally contributed to our foreign trade by the place it has won for American steel in world markets, established a bureau of research to develop new and extend old uses of its products at home. And at both May and October meetings of the Institute this year Mr. Schwab returned to his theme of 1928, pointing to promising fields that should be explored and developed. In no way could steel makers and steel consumers work together with such large results to both as in finding new places in which steel can best serve and in extending the use of existing secondary products into which steel largely enters.

Steel makers and builders of machinery alike have been largely opportunists in these 12 years that have followed the World War. More than in any equal period they have had to shape their policies to changed economic conditions rather than take the lead into new and better conditions. Their planning and thinking have been in terms to which industry was almost a stranger 20 years ago—a vocabulary in which mass production, equalized employment, rationalization, budgeted production, stabilization, standardization, hand-to-mouth buying, low inventory, instalment buying, mass distribution, vicious circle and profitless prosperity are key words. In the coming era of the market laboratory steel makers and machinery builders will make common cause in the prevention of unemployment. By developing new metal products they will function as creators of business situations rather than as creatures of situations that are thrust upon them.

In this greater future of the industrial field in which THE IRON AGE has been for so long an institution, I look to see it make a growing contribution to metal progress as an explorer, recorder and interpreter. I know something of the plans of its editors and am confident that as these take form in weekly performance they will add steadily to its power to serve the preeminent industry with which its name has been for so long inseparably linked.

Serious Then But Funny Now

YOU will laugh at some of the ideas that our grandfathers had, as expressed in these extracts from *The Iron Age* of early days. But remember that it is quite likely that our grandchildren will be equally amused at the way we did things in 1930.



Ain't We Got Fun?

Manufacturing note. When N. Du Tremplay attempted to use the vapor of ether in combination with steam, it was found that although considerable economy resulted, the joints, though steam-tight, were not ether-tight, and the engineers had to use safety lamps in the engine room to avoid being blown up. The whole scheme failed as a result.

From The Iron Age of November 14, 1867



Time for Lunch; There Goes the Whistle . . .

Fraser Bell & Loughran, 213 Pearl Street, exhibits Sargent's coffee boiler which, it is claimed, retains the aroma of the coffee while boiling and requires less coffee than other articles in that line.

The steam and aroma arising while boiling, coming in contact with the condenser, are immediately condensed and dropped back in the boiler and mix with the coffee.

This operation continues until the water in the condenser becomes sufficiently heated to allow the steam to pass up the tube, raise the valve and blow the whistle.

From The Iron Age of October 17, 1867



Gosh, What Else Could Happen? . . .

In a description of a conflagration at the Meriden-Britannia Works, the difficulties of industrial fire fighting in early days is graphically set forth. This account says:

"One of the water mains was shut, by mistake. At least fifteen or twenty minutes of valuable time was lost in confusion. On the arrival of the Charter Oak Company, they took a double hydrant directly in front of the fire and forgot to attach their hose. Washington Engine Company came up and attached to the same hydrant, which was the cause of many hard words and loss of more time. The hose boys were inexperienced and in stretching their hose they pulled off one or two lengths, which was just enough not to reach the fire. While these matters and the incidental confusion were progressing, the fire gained an almost unobstructed advantage. The powerful steam pump of the company was started in good season, but the water being very low, the supply was entirely inadequate. The falling slate from the roof rendered it almost impossible

to ascend the ladders and the combination of the above incidents, deficiencies and faults was sufficient to cause an almost hopeless confusion.

From The Iron Age of July 21, 1870



They Often Did Have to Push the First Ones . . .

The Detroit Journal of Commerce says: "A lapse of a few years and the energy and enterprise of our manufacturers have made gigantic strides toward elevating Detroit to her present proud position among the manufacturing cities of the United States, for she did not cease to push forward with unrelaxed vigor, until she is today the great manufacturing city of the West; and probably equalled only by the second manufacturing city of the world—Philadelphia. While other cities have been making continual empty noises, Detroit has quietly but steadily pushed forward the car of progress and is destined at no distant date to surpass the expectations of the multi-sanguine until she will stand without a rival.

*From The Iron Age of October 1, 1868
(And this was thirty years before the automobile came!—Ed.)*



The Note of Optimism Amidst Adversity . . .

Business continues generally dull, and we cannot hope for much improvement at present. Manufacturers are now exceedingly dull, merchants are very idle, consequently employment is greatly curtailed and workingmen are feeling the pinch severely. We can, of course, expect no speedy relief from congressional action and must therefore expect a period of depression; still we have no fear of a "panic" or a "crisis" or a general "bursting up." Thanks to the sound and

healthful cash system the country is generally solvent. Here in New York among the drygoods houses and perhaps the tea importers and one or two other interests, there may be failures, but the condition of the country is safe and healthy, although depressed.

From The Iron Age of December 12, 1867

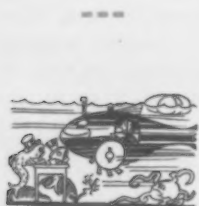


Chicago Crime

Wave, 1871 . . .

An invention likely to be of considerable use has just been patented by a Chicago genius. It consists in a safety lock to be fastened inside the pocket of ladies' or gentlemen's garments to prevent the stealing of pocketbooks and other valuable things.

From The Iron Age of June 8, 1871



This Sounds Fishy

A submarine velocipede—an inventive Frenchman has recently patented in France an extraordinary submarine boat which is formed like a fish and constitutes in reality a submarine velocipede. It is made of stout hide, strongly supported at the sides by very tough whalebone, and is from 16 to 20 ft. in length. Its exact shape is that of a young sperm whale. In the interior is a mechanism simple and ingenious by which the fins and the tail are moved on the plan of the pedals of a velocipede. The navigator lies on his stomach at full length and steers the boat in any direction, backwards, forward, up or down without fatigue and with scarcely any effort. As a provision against accidents, a long tube of gutta percha floats on the surface and communicates with the interior in case the supply of condensed air should give out, but this is almost

unnecessary for simply by rising parallel with the surface another supply of air can be taken in which will last for a considerable time.

From The Iron Age of July 7, 1870



It's My Turn, Brother

A new telescope for examining objects situated under water was recently tested on one of the French canals. Reports affirm that pencil marks could be clearly distinguished at a depth of five feet. Its practical application will be the examination of the hulls of vessels without it being necessary to dock them.

From The Iron Age of October 24, 1867



Health Hazards of 1869.

Beware of Red Hot Stoves . . .

Cast Iron Stoves—Some experiments which will have great practical utility have just been made in Paris on these pestiferous, fever-generating engines, cast iron stoves. From all these numerous and varied experiments it appears, first, that beside the immediate and serious danger inherent to all metal stoves from their so easily attaining a red heat, cast iron stoves offer the particular drawback of evolving a considerable but variable quantity of oxide of carbon, a highly poisonous gas. Second, that under the same circumstances sheet iron has the same defect, though in a lower degree. Third, that in rooms heated by such stoves the carbonic acid of the atmosphere and that emanating from persons are apt to be decomposed and set oxide of carbon at liberty. Fourth, that the gas may proceed from different sources, viz., from a cast iron stove, since it will penetrate through the

metal, from the direct action of the oxygen of the air on the carbon of the cast iron at a red heat, from the decomposition of carbonic acid or lastly from the organic dust suspended in the air. Fifth, the want of ventilation may greatly increase the danger, and sixth, that iron stoves not internally lined with non-conducting clay to prevent their becoming red hot, are highly injurious to health.

From The Iron Age of June 24, 1869



A Hard Winter

for the Cops . . .

From our experiences of the present winter, we have learned that but little can be accomplished in the direction of keeping streets free from snow without the use of special machinery and appliances. The Police Department with the aid of a regiment of Italian brigands have at a cost of many thousands of dollars mitigated the inconvenience of snow by clearing some streets and breaking up the ice in others to facilitate its thawing.

From The Iron Age of January 30, 1873



And Then They Went into the Laundry Business! . . .

Business item. Mr. C. Koopmanschoop, the coolie laborer contractor has agreed to furnish a St. Louis foundry with 50 skilled Chinese laborers at \$1.25 per day, the laborers to be delivered at the foundry in August. Mr. K. is a Hollander by birth, a resident of California and has made six voyages to China during the past ten years, bringing over in person or by deputy not less than 50,000 Chinamen, now settled in California. He supplied 10,000 coolies to the Central Pacific Railroad Company.

From The Iron Age of August 5, 1869



...1891...



✦ Out of such crude beginnings as the
 er's melting pot, utilized by Edward
 as his first electric reduction furnace,
 the manifold industrial fruitions of
 ture. ✦ A full decade before the ma
 beginning, the way was being pr
 under the mysterious guidance of
 Power which dictates Man's progr
 motor car was to need the precisi



IRON AGE

Published Weekly, 100 West Wall Street, New York, N.Y.

The United States Cartridge Co.



Superior Quality Ammunition

Manufactured by the United States Cartridge Co., New York, N.Y.

Handmade and Machine Made

Best of Both

For Sale by the United States Cartridge Co., New York, N.Y.

Price 10 Cents

Per Dozen \$1.00

Per Case \$10.00

Per 100 \$100.00

Per 1000 \$1000.00

Per 10000 \$10000.00

Per 100000 \$100000.00

Per 1000000 \$1000000.00

Per 10000000 \$10000000.00

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little plumb-
G. Acheson
e, have come
tra-tempera-
or car had its
pared for it,
he Supreme
ss. For the
n of grinding

and lapping; calcium carbide for the welding of its parts; it was to need the refractories and the electric furnaces which would provide it with alloy steel; it was to need aluminum, through the electric reduction process. And so, through Thompson, Hall, Acheson, Castner and a host of others, the heating power of the electric arc comes into the service of mankind, preparing the way for the motor car.

THE IRON AGE
A Journal of the Iron, Steel and Coal Trades

The Union Metallic Cartridge Co.
Superior Quality Ammunition

THE IRON AGE
PUBLISHED WEEKLY
By THE IRON AGE CO.
100 N. 3rd St., New York, N.Y.

COKE
Superior Quality
Pure Aluminum

THE IRON AGE
PUBLISHED WEEKLY
By THE IRON AGE CO.
100 N. 3rd St., New York, N.Y.

THE IRON AGE
PUBLISHED WEEKLY
By THE IRON AGE CO.
100 N. 3rd St., New York, N.Y.



Come One, Come All, Casey Will Swat the Ball . . .

The employees of the Hart Manufacturing Company and Russell & Erwin Mfg. Company will play a matched game of baseball on Saturday next at four p. m. on the Champion Baseball Club grounds, Grove Street near Railroad Avenue, Jersey City.

From The Iron Age of June 15, 1871



And Then Came the Reckoning . . .

The game of baseball between the nines of the Russell & Erwin and Hart Manufacturing Company last Saturday resulted according to the decision of the umpire in a victory for R. & E. by a score of 40 to 35. The Hart nine, however, takes exception to the rulings of the umpire and have referred the issue at question to "acknowledged authority." If the umpire was wrong, they won the game by four runs.

From The Iron Age of July 13, 1871



And They're Still Talking About It . . .

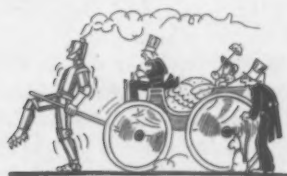
It seems that the proposition to tunnel under the English Channel is not to end in talk after all. The company registered in London on the 15th ult., is about to excavate a trial shaft and drift-way on the English side and it would

seem if found practicable to push the work on until it reaches the shores of France.

From The Iron Age of February 15, 1872

Wonderful Mechanism —A Steam Man . . .

Mr. Ladock Deddrick, a Newark machinist, has invented a man, that moved by steam, will perform some of the most important functions of humanity, standing upright, walking or running, as he is bidden in any direction and almost any rate of speed, drawing after him a load whose weight would tax the strength of three stout draft horses. The man stands seven feet and nine inches high, the other dimensions of the body being correctly proportioned. He weighs 500 lbs. Steam is generated in the body or trunk, which is nothing but a 3 hp. engine, like those used in our steam fire engine. The legs which support the automaton are complicated and wonderful. The steps are taken very nat-



urally and quite easily. Each step or pace advances the body two feet and every revolution of the engine produces four paces. As the engine is capable of making more than 1,000 revolutions a minute, it would get over the ground on this calculation, at the rate of a little more than a mile a minute. As this would be working the legs faster than would be safe on uneven ground or on city cobblestones, it is proposed to run the engine at the rate of 500 revolutions per minute, which would walk the man at the modest speed of half a mile a minute. The fellow is attached to a common Rockaway carriage whose shaft serves to support him in a vertical position. To the soles of the feet spikes or corks are fixed which effectually prevent slipping. An upright post, which is arranged in front of the dash board and within easy reach of the front seats, sustains two miniature pilot wheels, by turning which these various motions and evolutions are directed. To prevent the giant from frightening horses, Mr. Deddrick intends to clothe it and give it as nearly as

possible a likeness to the rest of humanity. The boiler and such parts as are necessarily heated are to be encased in felt or woolen undergarments. The cost of this first man is \$2,000 through the makers, Messrs. Deddrick & Grass, who expect to manufacture succeeding ones warranted to run a year without repair for \$300.

From The Iron Age, January 23, 1868



Merrily, We Roll Along

The Pall Mall Gazette says that the velocipede is becoming a formidable rival to the horse in Paris. One velocipedist rode down the Champs Elysées the other day in an "Americane" drawn by two velocipedes on which were mounted two postilions or jockeys. The velocipedal skill of M. de Visin is said to be something extraordinary. A few weeks ago he undertook to travel on a velocipede from Angers to Paris, and actually went as far as Tours, a distance of about fifty-four miles, when the machine broke.

From The Iron Age of June, 1868



And Here's "How"

Literature keeps pace with the progress of industry. Our shops have supplied the material while the inventive skill of our mechanics has fashioned the American velocipede equal to that of any other country, but the necessity remains for a work giving practical instructions to those learning to manage the instrument. This want has been supplied by the "American Velocipede Manual," which gives full instructions to the beginner and contains valuable information for experts.

From The Iron Age of April 1, 1869

When Steel Supplanted Iron for Shipbuilding

IN the decade from 1880 to 1890 the construction of ships with metallic hulls was turned pretty completely over from wrought iron to steel. Ships built under Lloyd's Registry in 1880 included 460,000 tons with wrought iron hulls and only 35,000 tons with steel hulls. Ten years later the wrought iron hulls had diminished to 50,000 tons and the steel hulls had gone up to 1,079,000 tons. It took 29 years, from 1877 to 1906, to make the complete transformation. In 1877 there were no ships classed by Lloyd's as of steel construction, while in 1906 there were no wrought iron ships classed.

Technical Developments Came Slowly at First

LONG before THE IRON AGE was founded a number of important inventions relating to iron and steel had been made in Great Britain. Thus, a rolling mill for rolling sheet iron was developed in 1728. Fifty-five years later Cort brought out a method of using grooved rolls for rolling bars and rods. Another fifty-five years passed and Nasmyth invented his steam hammer.

Meantime Huntsman had introduced the crucible process in 1739, whereby the slag might be worked out of the mass, instead of leaving it in, as in wrought iron. This process, which was costly at that time, remains costly. For many years it was used merely for the most particular forms of steel, such as tools and special instruments. The crucible process is rapidly being supplanted by the electric furnace process and before very long will perhaps be mainly of historic interest only.

Sir Henry Bessemer (not Sir Henry then, of course) invented in 1856 his process of making the heat developed by the rapid oxidation of impurities in pig iron raise the temperature above the melting point of steel—just a year after THE IRON AGE began publication.

Eight years later, in 1864, the Martin brothers in France developed the open-hearth process, whereby steel of any desired carbon content can be made by mixing pig iron and scrap in the right proportions. They used the regenerative gas furnace, which had been developed by Siemens about 1860, as the basis for their process.

Not until nearly 15 years later, however, was it possible to obtain in the open-hearth furnace the desired elimination of excessive phosphorus content. In 1878 Thomas showed how the phosphorus could be removed readily in the presence of a slag rich in lime.

Still, we had the trouble of inability to control sulphur and silicon, particularly in the Bessemer operation. Accidental abnormalities in blast furnace casts brought greatly variable, and sometimes unknown, quantities of these two elements, and resulted in steel of uncertain qualifications. In this case, however, the remedy was mechanical rather than chemical. Capt. W. R. Jones invented the mixer, whereby blast furnace casts containing excessive silicon and sulphur had the excess diluted by mixing with other casts of more normal characteristics, and we were well on our way to a definite control in the composition of steel.

Development of Bessemer Converter in America

WHEN the first Bessemer converter was being set up in the United States, Thomas R. Morgan, father of the Morgan Engineering Co., Alliance, Ohio, was directly concerned in getting it to work. That he had a direct hand in this development may be said to add to the engineering stature of an inventive genius of 60-odd years ago. The institution which he founded, of course, has long been well known for its heavy machinery, including cranes, forging presses and a great variety of equipment for steel mill and other heavy-duty use.

Mergers in the Early Days

THE Bethlehem Iron Company of Bethlehem, Pa., has not only added additional buildings to its own works, but is daily making other improvements for which its facilities and capacities are increased. They have now completed an arrangement by which the property of the Northampton Iron Company falls into their possession. The consideration for the property was 3000 shares of the stock of the Bethlehem Iron Company. The stock is now quoted at about \$80 per share in the market.

Extract from The Iron Age, Oct. 15, 1868.

Wrought Iron Structural Beams in 1869

THE Buffalo Union Iron Works in Buffalo, occupying a tract of 52 acres of land, have three blast furnaces which turn out about 30,000 tons a year. The company gives special attention to wrought iron beams for large buildings. Of these, they can turn out 15,000 tons and 10,000 tons of merchant bar per year. Some of the finest buildings in New York such as Stewart Store, The Parks Bank, the Ledger Building, etc., were furnished with beams by these works.

Extract from The Iron Age, March 4, 1869.

"Big Pumping Engine Made in Philadelphia"

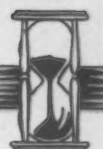
THE Southwark Foundry of Philadelphia has recently put in operation an enormous engine, the diameter of whose cylinder is 110 inches; stroke, 10 feet; two fly wheels of 30 feet diameter and weighing each about 90 tons; main beam of four parts each 36 feet from center to center and 9 feet deep through center. Beam center is of wrought iron, 27 inches in diameter; main shaft, 27 inches in diameter. The total weight is estimated to be without pump 1,500,000 lbs.; has a capacity of 15,000 gallons or 60 tons, pumps 300 feet high per minute. The beams and pins weigh about 210,000 lbs. and the other in proportion.

Extract from The Iron Age, May 11, 1871.

Fairbanks' Scales in 1868

AT the St. Johnsbury Scale Works they employ 400 men and manufacture from 800 to 1000 scales per week including all sizes. They melt from twelve to fifteen tons of pig per day. The freight to and from St. Johnsbury Station last year was nearly 10,000 tons. The aggregate manufacture of scales for the year is something over \$300,000. Every description of weighing apparatus is manufactured from the small prescription scale of a druggist to the weigh lock scale of 500 tons for weighing canal boats. The present firm consists of Thaddeus Fairbanks, and Franklin Fairbanks. The scales were originally (in 1830) invented by Thaddeus, who was then associated with Thaddeus Fairbanks, an older brother.

Extract from The Iron Age, Oct. 22, 1868.



OLD TIMERS' SECTION

THE pages which follow contain a striking revelation of American progress. All of us are familiar with the tools of modern industry. But few of us realize how short a period it has been since the crude beginnings of many of our well known plants and their products.

So the text and illustrations on the pages which follow, culled from the files of concerns in the metal working industry that have been in existence a quarter century or more, drive home the keynote thought of this issue. We see in them convincing proof of the speed of progress; of the rapid growth of design and of those organizations that intelligently serve the needs of industry.

Success is never achieved by standing still. Progress is possible only for those who move forward.



▲ ▲ ▲
THE OLD
AND
THE NEW
IN
BLAST FURNACES
▼ ▼ ▼



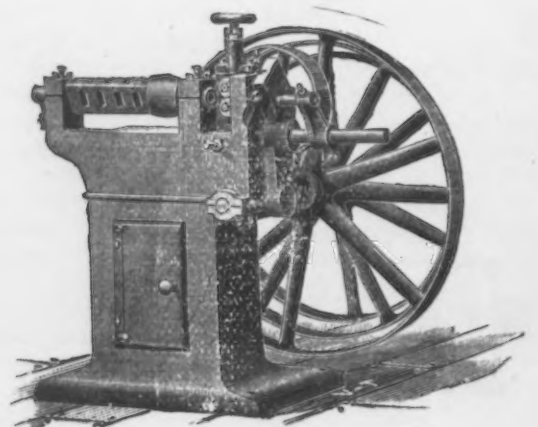
HERE are two structures, located not more than four miles apart, in Hancock County, W. Va. They represent the old and the new in blast furnaces.

The stone furnace, built in 1790, or thereabouts, smelted the ore from which were made the cannon balls for Commodore Perry, in 1813. Its capacity was 25 tons of pig iron a week. This was hauled to market by ox-teams, probably to points as far away as Pittsburgh.

Contrast this with the neighboring modern structure, the No. 1 blast furnace of the Weirton Steel Co., Weirton, W. Va. This giant, with its capacity of 1100 tons of pig iron a day, has in reality grown out of the little stone furnace in the past century and a quarter.

FIRST AUTOMATIC WIRE-STRAIGHTENING AND CUTTING MACHINE

BACK in 1866, John Adt built the first automatic wire-straightening and cutting machine, shown in the accompanying illustration. At that time, he was operating a company under his own name. Later on this became John Adt & Son, and finally present company, F. B. Shuster Co.



▲ ▲ ▲

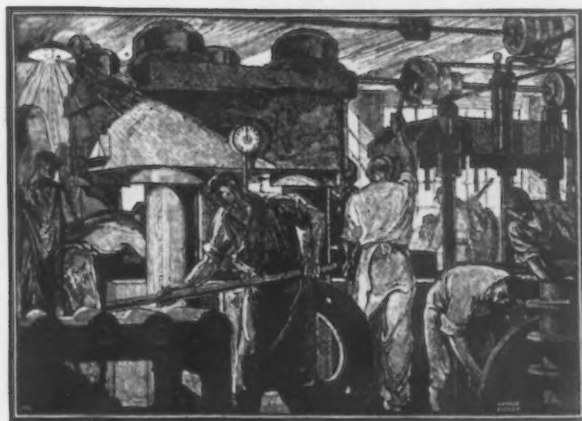
WOODBLOCK REPRODUCTIONS OF NORTON MURALS TELL THE STORY OF GRINDING-WHEEL PRODUCTION

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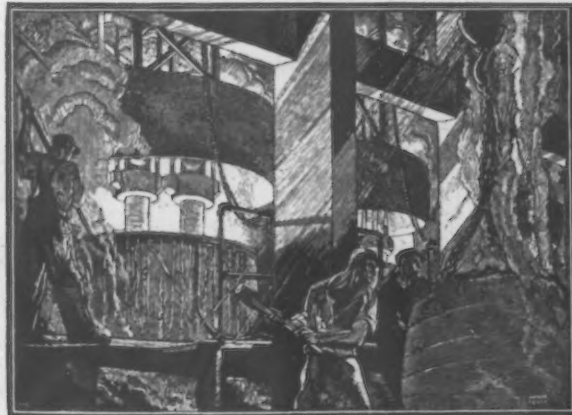
AT Norton Hall, the administration building of the Norton Co., Worcester, Mass., is a set of mural paintings which depict, in graphic form, the making of grinding wheels. Woodblock reproductions of some of these striking murals, reproduced here, dramatize in an effective way this process of modern industry. The Norton Co. belongs in this story of the old timers of American industry, having been established 45 years ago.



Under the heat of the kiln, the ceramic bonds are converted into glass, binding together the abrasive cutting particles.



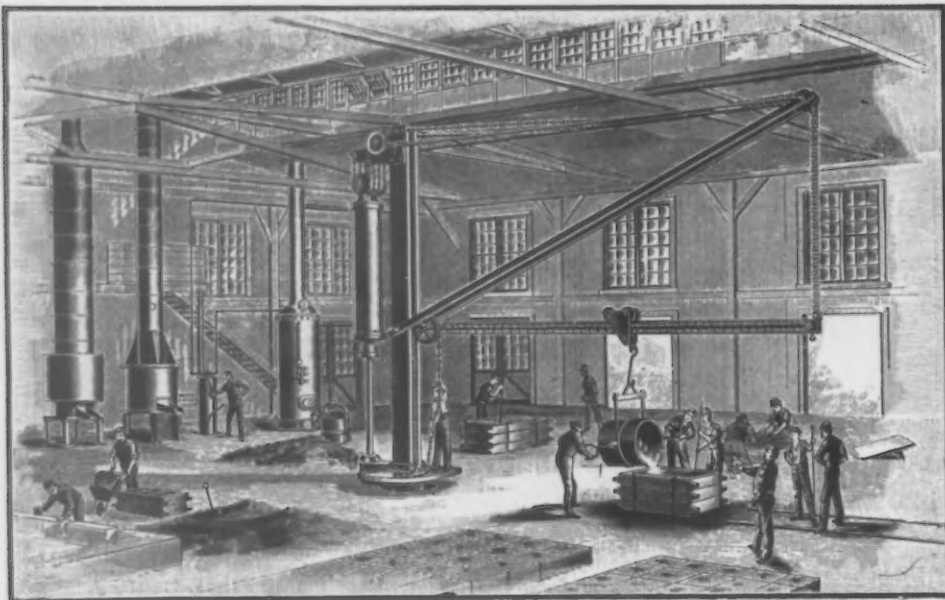
Heavy presses force the wet abrasive, properly bonded, into the form of circular wheels.



Bauxite, age-old product of the primeval laboratory, is changed, under the terrific temperature of the electric furnace, into Alundum.

In the truing room the grind-wheels are given their final shaping with hardened steel and diamond-pointed tools.





▲ ▲ ▲
 "HOOK 'ER
 TO THE
 BILER"
 ▼ ▼ ▼

CRAIG RIDGWAY & SON CO., Coatesville, Pa., manufacturer of steam-hydraulic elevators, was a pioneer in the development of cranes and elevators. Mr. Ridgway was also a pioneer in the application of the human-interest element to advertising. His slogan: "Hook 'er to the Biler," became known in all quarters of the world.

William H. Ridgway sends us the following interesting extract from an address by (then) Premier Stanley Baldwin, of England, before the Advertising Clubs of the World. Mr. Baldwin, in this speech, referred to the Ridgway elevator advertising in *THE IRON AGE*:

"Years ago there was no paper in my own trade comparable with one published in America under the name of *THE IRON AGE*. It was a wonderful paper, which used to publish week by week advertisements of a crane which so fascinated me that I used to count the hours from Saturday to Saturday when I might see what new charms had attached themselves to that crane during the week. (Laughter)

"It did all the work of a shop without any assistance. It went home at night and put the baby into the cot and brought father home from the saloon. (Laughter)

"That illustrates how a good advertisement lingers in the memory of a man who considers himself singularly impervious to all those influences. (Laughter)"

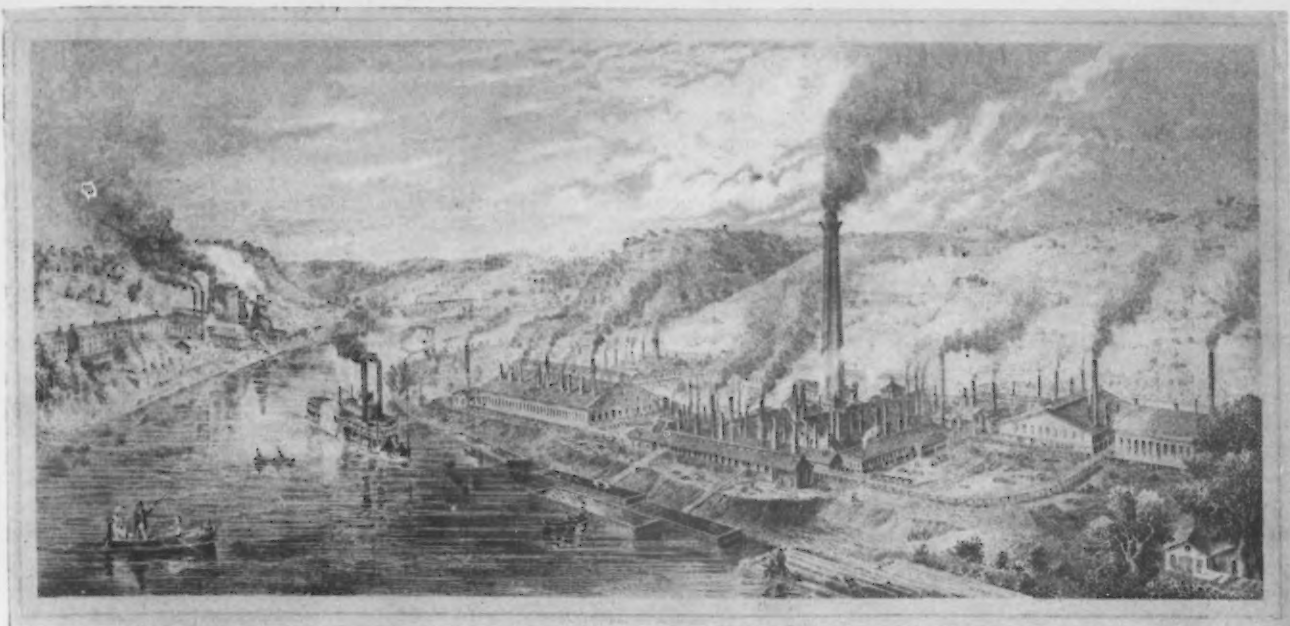
The woodcut reproduced herewith shows an old Ridgway steam crane installation at the original Leland Faulconer foundry in Detroit.

VESTS AND SUSPENDERS IN THE MACHINE SHOP OF 1881

ESTABLISHED in 1861, the Jarecki Mfg. Co., Erie, Pa., consisted of no capital, two hand lathes and a small brass melting furnace. Henry and Charles Jarecki, the founders of the business, however, had the knowledge, ambition and energy that made lack of money but a small handicap.

The illustration shows the interior of the machine shop 20 years later, in 1881, as reproduced from a woodcut in the *Scientific American*. Contrast this picture with a modern machine shop interior, and you will get a graphic idea of the progress made since that time.



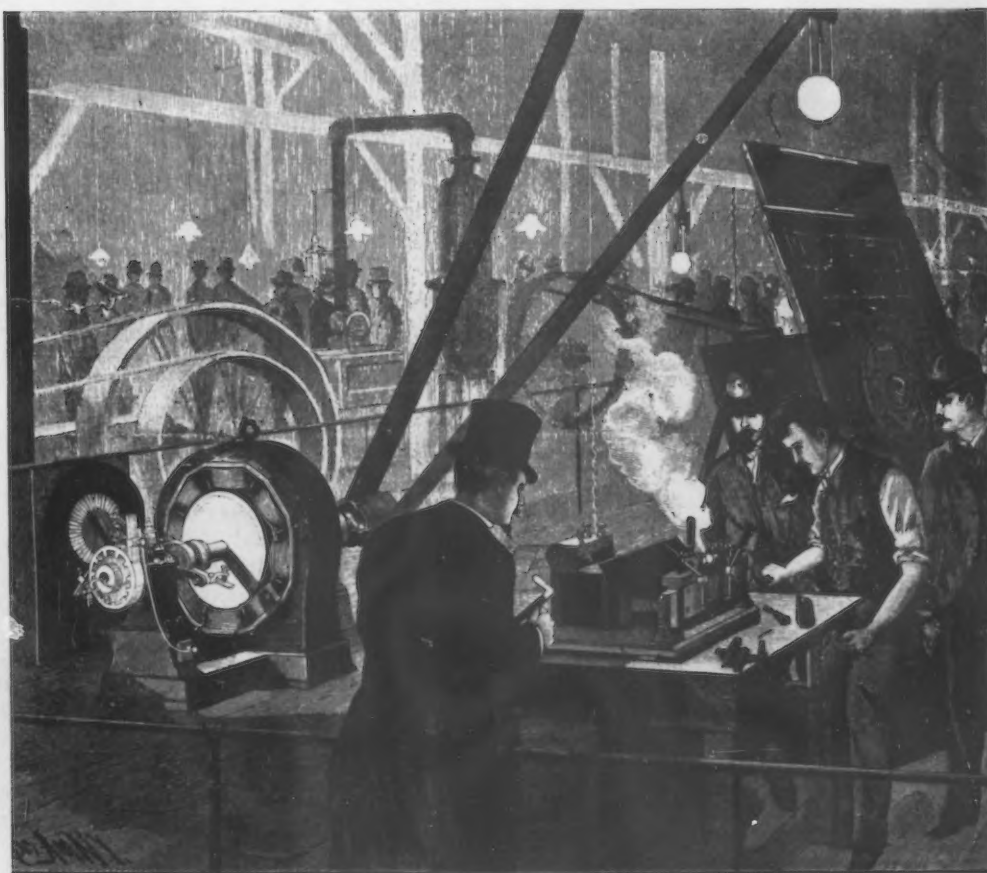


AN AMERICAN IRON WORKS OF THE EARLY '50's

THE Jones & Laughlin plant at Pittsburgh in the middle of the last century. This shows the South Side works at right and the beginnings of the Eliza furnaces at left, across the Monongahela River.

WHEN ELECTRIC WELDING WAS IN ITS INFANCY

ELECTRIC welding at the American Institute Fair, New York, Nov. 26, 1887—Prof. Elihu Thomson's process. Courtesy of the Thomson-Gibb Electric Welding Co.



A Review of Progress in Arc-Welding

THE rapid rise of arc-welding to the position of an important world-wide industry is all the more remarkable when you consider how crude and inadequate were its first applications.

As far back as 1880, experiments were performed with the electric arc, and in 1887 arc-welding was put into practical use. In those days, the pieces to be welded were placed on a cast iron plate, or "electric anvil," which was mounted on an insulated table and permanently connected to a series of batteries.



Although, in 1887, metal tanks, casks and similar products were successfully repaired by this method, many metals, including cast iron, brass, bronze, copper and nickel could not be welded, and it was impossible to weld at currents above 150 amperes.

In the early '90's, an English concern installed a carbon arc-welding outfit, with three dynamos of 550 amperes, but although this equipment marked a definite advance over previous methods, it required the use of 1800 storage battery cells to accommodate the peak load.

It was not until about 1910, when a number of commercial electric-welding plants were established, that arc-welding became widely adopted. At that time, the principal impediment to sound welding was the failure to obtain close control and to overcome the use of too great a current and too long an arc. Moreover, until 1915, the only electrode available commercially was a very low carbon wire, Swedish or Norway iron, which had low tensile strength

and ductility, and metallurgists had already learned that one analysis of welding wire could not be applied to different analyses of parent metal.

The first great achievement in arc-welding occurred during the war, when the German ships interned in American ports were repaired by the electric arc. It was followed by demonstrations, in practically every industry, of the speed, economy and safety of electric welding.

That arc-welding as a method of joining metals has progressed almost to a state of perfection is evidenced by the fact that today there are analyses of wire available for

▲ ▲ ▲
COMMERCIAL
ARC-WELDING
A
YOUNG
INDUSTRY
▼ ▼ ▼

practically every metal and welding purpose; there are modern electric welding machines which are not only remarkably simple and easy to operate, but which make it possible to weld even up to 800 amperes if necessary.

(This interesting and comprehensive review of developments in arc-welding is supplied by the Wilson Welder and Metals Co., Inc., New York.)

Back to 1836

THE Reading Iron Company, of Reading, Pa., dates back to 1836, although the present company name was established in 1889. In the early plant, bar iron and cut nails were made in large quantities.

There were 250 men on the payroll in 1836; quite a large plant for those times. Today, there are approximately 3300 men employed by the company.

Over the long term period, certainly, improved methods and machinery, instead of making less jobs, have the effect of multiplying employment very considerably.

Development of the Molding Machine

THE Tabor Manufacturing Co., Philadelphia, contributes the following interesting and informative account of the development of the molding machine in its early days. It was prepared by the company's late president, Wilfred Lewis.

"Although modern industry depends upon the foundry for a large part of its products and the ingenuity of inventors has been busily engaged for generations in the evolution of labor-saving machinery, very little of this effort has been devoted to the improvement of the foundry itself, and it is only within comparatively recent years that machine molding has developed much importance as an art.

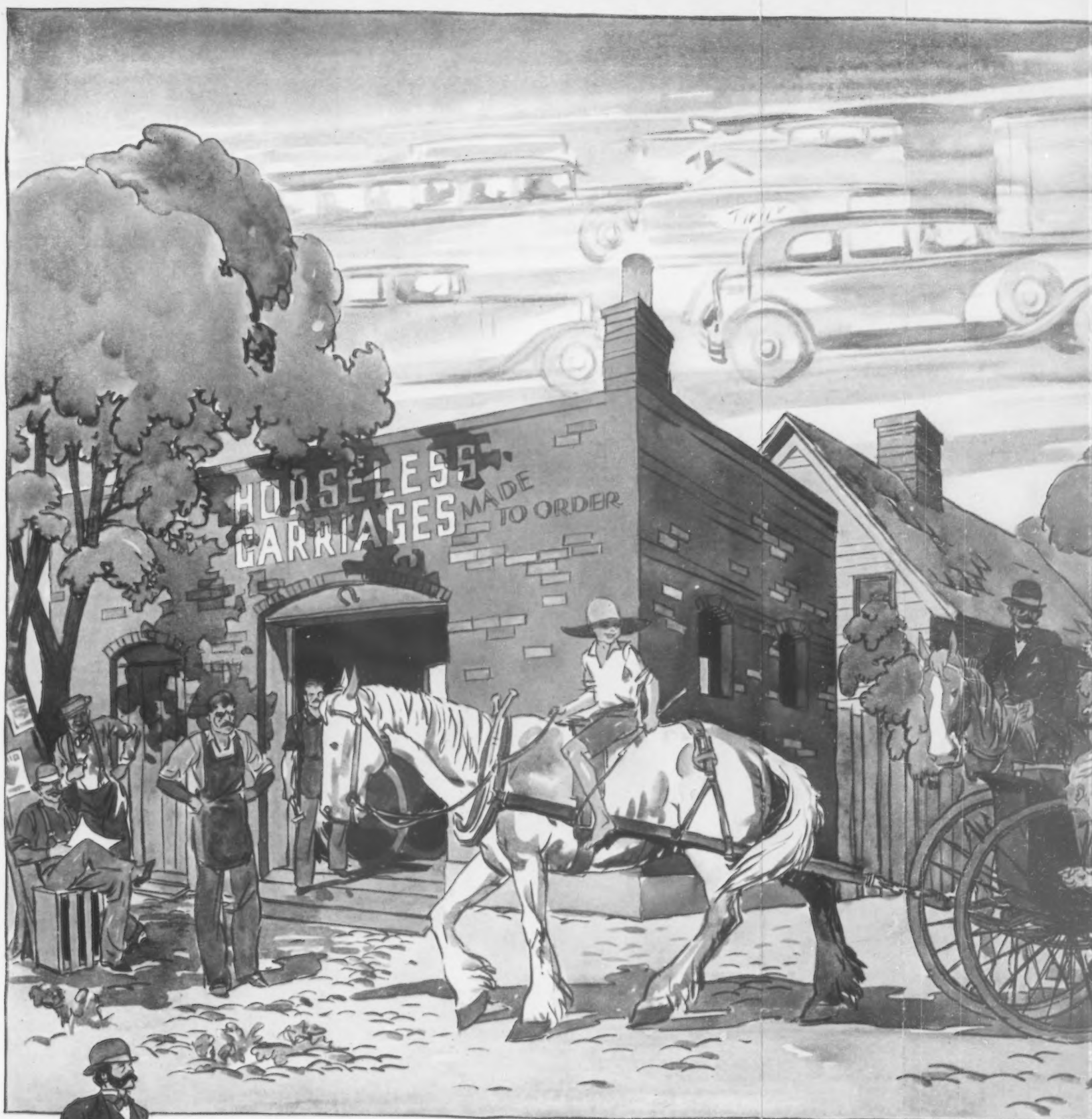
"In the year 1880 an English patent was granted for molding screws, the patterns for which were backed out of the sand by lead screws of the same pitch. This was simply a pattern drawing machine of rather ingenious construction, but the English records do not touch again upon machine molding until 1839, when a very similar patent appears.

"From this time forward more interest seems to have been aroused and these patents were soon followed by others for packing sand by mechanical means, including hydraulic cylinders, stampers and rollers of the road-roller type.

"Machines for molding gears and pipes also appear in the first half of the nineteenth century, and in 1843 we find an American patent on the molding of cannon balls.

"Later, in 1869, the first jarring machine patent was taken out, but it is not proposed to give a history of the art of machine molding from patent office records, and it may simply be noted that the art began in a small way on bench work and continued chiefly in its application to small molds that one or two men could handle until the end of the last century.

"Larger work was not generally regarded as applicable to machine molding until the jarring machine began to emerge from a long period of obscurity and demonstrate its peculiar fitness for ramming large bodies of sand. Its development for large work belongs mainly to the present century and through its means the art of machine molding has been extended to embrace nearly everything molded in sand."



...1900...

✠ The baby born in 1855, now a man of forty-five years, witnesses the coming of the "horseless carriage." ✠ How these amused bystanders would have laughed had some one told them that, in less than thirty years, these crude contraptions would breed a progeny of more than thirty million motor cars,

virtually highway its pace transform from idly stantly s multiple



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witnesses the coming of the
age." ✚ How these amused
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raptions would breed a pro-
an thirty million motor cars,

virtually banishing horses from America's
highways. ✚ Progress surely is speeding
its pace when it can work such a complete
transformation in so short a time. The period
from idea to achievement is being con-
stantly shortened because of the ceaseless
multiplication and improvement of means.



THE IRON AGE
A WEEKLY OF THE IRON, STEEL, RAILROAD AND SHIP BUILDING INDUSTRIES
PUBLISHED BY THE IRON AGE COMPANY, NEW YORK, N. Y.
Subscription price, \$5.00 per annum in advance. Single copies, 15 cents.

A. M. C. Sinks Steel
The A. M. C. Sinks Steel is a new and improved type of steel sink, made of high quality steel, and is the best sink yet made. It is the only sink that will not rust, and it is the only sink that will not warp. It is the only sink that will not break, and it is the only sink that will not leak. It is the only sink that will not cost more than a nickel.

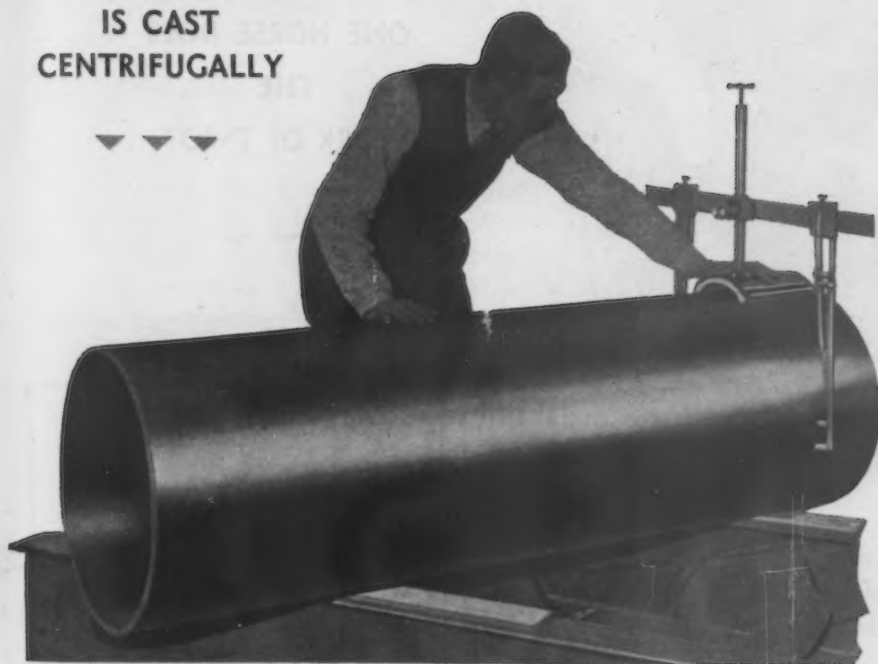
CAHILL BOILERS
The Cahill Boilers are the best and most reliable of all boilers. They are made of high quality steel, and they are the only boilers that will not rust, and they are the only boilers that will not warp. They are the only boilers that will not break, and they are the only boilers that will not leak. They are the only boilers that will not cost more than a nickel.

CAPIVILLI IRON NAILS
The Capivilli Iron Nails are the best and most reliable of all iron nails. They are made of high quality steel, and they are the only iron nails that will not rust, and they are the only iron nails that will not warp. They are the only iron nails that will not break, and they are the only iron nails that will not leak. They are the only iron nails that will not cost more than a nickel.

CONK
The Conk is the best and most reliable of all iron nails. It is made of high quality steel, and it is the only iron nail that will not rust, and it is the only iron nail that will not warp. It is the only iron nail that will not break, and it is the only iron nail that will not leak. It is the only iron nail that will not cost more than a nickel.

MAGNOLIA METAL
The Magnolia Metal is the best and most reliable of all iron nails. It is made of high quality steel, and it is the only iron nail that will not rust, and it is the only iron nail that will not warp. It is the only iron nail that will not break, and it is the only iron nail that will not leak. It is the only iron nail that will not cost more than a nickel.

HEAVY TUBING IS CAST CENTRIFUGALLY



SANDUSKY, OHIO, is the home of The Paper & Textile Machinery Co., known in the engineering and industrial world as pioneers in the art of centrifugally casting heavy tubing. Tubular castings up to 22 tons in weight are produced and machined to within a few thousandths of an inch accuracy.

W. H. Millspaugh, widely known for his inventions in the paper making field, was the founder of this company and is entitled to credit for commercializing the art of centrifugal casting and first applying it to the manufacture of bronze rolls for patented equipment used in paper mills.

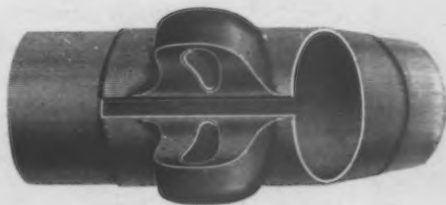
After centrifugally cast tubing had been introduced to the paper-making field other industries became interested in applying the new product to other uses. Shipbuilders in particular began to use it, as it exactly filled their requirements for sleeves for propeller shaft bearings and rudder posts. During the World War the company's resources were taxed to the utmost to supply the Emergency Fleet's constantly increasing demand and to carry through successfully the experiments and production problems connected with the manufacture of periscope tubes for the United States Navy.

Bicycle Gave Impetus to Stamping Industry

METAL stamping today is a large and important industry, contributing in substantial measure to our output of automobiles, airplanes, refrigerators and thousands of other products. Thirty-four years ago, when the Crosby Co. of Buffalo was established, however, the stamping industry was in its infancy.

The coming of the bicycle into widespread use furnished the first big impetus to the development of commercial stamping. The Crosby Co. played an important part in this development, and the experience thus gained was of tremendous service to them when the coming of the automobile created large opportunities for metal stampings.

The illustration is from a woodcut of an old bicycle connection, made by the company some 30 or more years ago, and a real job of stamping at that time.



The Days of Cast Iron Bearings on Grinders

FORTY years ago, the Ransom Manufacturing Co. of Oshkosh, Wis., started making a little bench type, belt driven grinder. No guards were furnished on these machines and no one expected them to be. The bearings were of cast iron, nicely reamed to a fine finish, and cold-rolled steel was used for the arbors. These cast-iron bearings used to run for a great many years without adjustment, but the coming of the anti-friction bearing made them gradually obsolete.

Great improvement has been made in the serviceability of grinding machines in forty years. With the proper installation of ball bearings on grinding machines, they should last an ordinary life time without any repairs. The machines are much heavier and therefore steadier running. The abrasive wheels are made in better balance and with more care as to the size of the hole, which insures much better running conditions. The guards now protect the operator against a broken wheel. In olden times, all of the machines were belt driven and practically all of them from overhead. These belts used to carry the emery and dust through the shop, shut off the light, and the countershafts were objectionable. Now the machines are made self contained with the motor on the machine, which leads to better working conditions in the shop.

"Make the Darn Thing Work!"

PROBLEMS are plentiful in the business of designing and making special machinery. The Baird Machine Co., Bridgeport, Conn., has been engaged in this sort of business for over sixty years, and it would be interesting to know just how many problems have been faced during this period.

J. H. Baird, the founder of the company, went to Huntington, Conn., in 1846, and started a shop for the manufacture of tools and special machinery. He often remarked, "Well, I don't care if I did lose money; I made the darn thing work." During his lifetime, Mr. Baird invented a large number of highly specialized mechanisms.



▲ ▲ ▲
 "ONE HORSE DOES
 THE
 WORK OF TWO"
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ANTI-FRICTION bearings have played a most important part in our industrial development. Their influence may be said to rank closely with the discovery of petroleum and the introduction of alloy steels.

Those of us who associate the roller bearing with its modern applications in production equipment and transportation may overlook the fact that its history goes back many centuries. Even in this country, there is a record of a roller bearing installed in a church weather vane, which ran for 115 years without attention.

The tapered roller bearing was produced by Henry Timken in 1898, and was originally intended for wagon and carriage wheels. One of the early advertisements, which is reproduced here, tells how to make one horse do the work of two.

Another illustration shows one of the first so-called automobiles, which was Timken equipped.

VEHICLES

HAETON

Illustrated in outline, possesses a high degree of essentials of ideal phaeton. Easy entrance, roomy interior and light combined rich design, grade material, fine finish, larger illustration.

Waterloo, N.Y.

TO EUROPE
 415 tons, with attraction
 of Switzerland; also
 away, New-York.

RO-VAPOR

position because they
 ple, seaworthy, safe,
 70 to 50 ft. \$150 buys a
 catalogue of Steam and
 now; avoid spring rush.
 C), Racine, Wis.



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 TABLET COMMEMORATES
 AMERICAN PIONEERS
 IN STEEL MAKING
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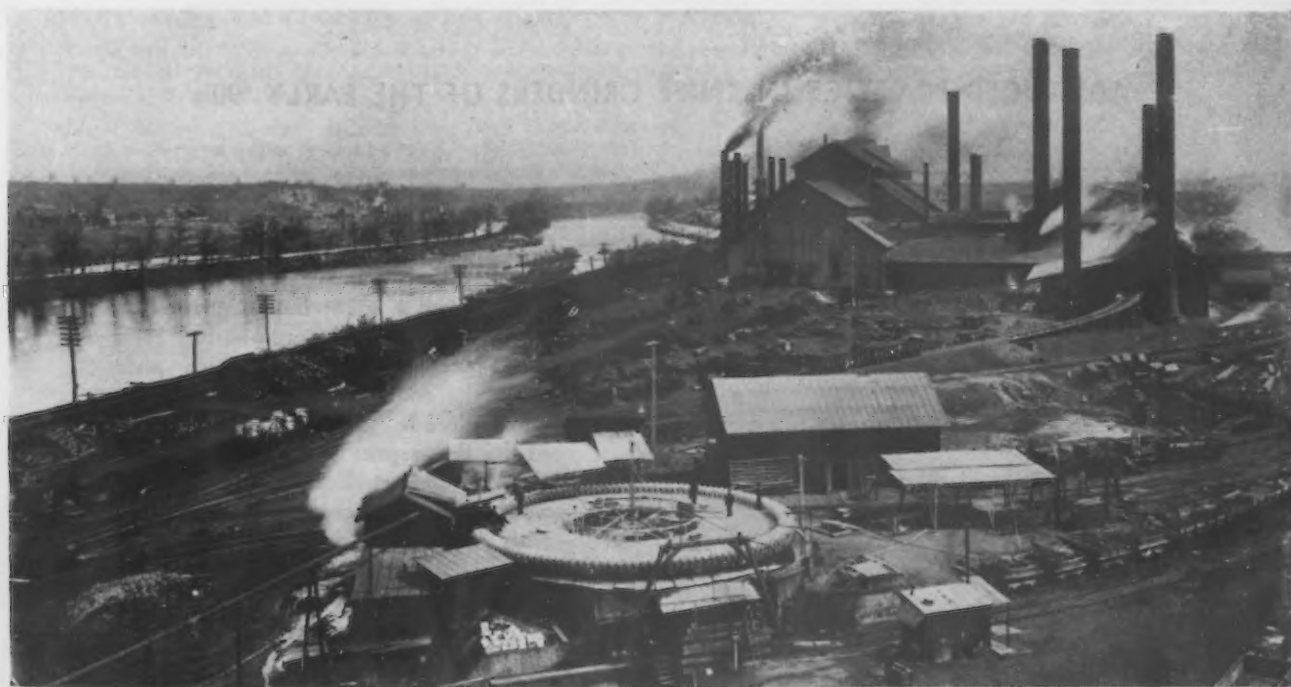
THIS picture of a bronze tablet on the Wyandotte Public Library, Wyandotte, Mich., commemorating the erection of the first Bessemer steel converter used commercially in America, was supplied by J. B. Ford Co., of that city.

EARLY BETHLEHEM MILESTONES OF PROGRESS

THE Bethlehem Steel Co. dates its beginning back to 1857. The first office building of the company (then the Bethlehem Iron Works), is shown in the accompanying reproduction of an original painting. Also shown is the original Kelly steel converter, the first successful converter in America for the production of Bessemer steel. It was first used at the Cambria Iron Works in 1861-62.

The Conemaugh Furnace, a blast furnace of the period of 1857, appears in center of page. This was located in Cambria County, Pa., but was not a Cambria Iron property. The photograph was supplied by the Bethlehem Steel Co.

In foreground at bottom of the page the Bethlehem circular pig casting machine, of 1906, is shown.



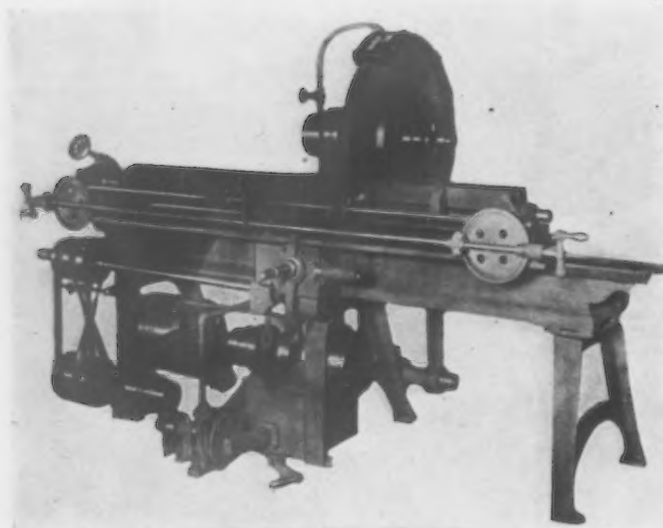
FOUNDATIONS OF WHEELING STEEL CORPN.

BELOW are the remains of one of the early iron furnaces at Principio, Md., a monument to the fortitude and industry of those who really laid the foundation of the Wheeling Steel Corp'n. Near this old furnace, there remain today the ruins of the first crude furnace stack built by the Principio Co. in 1715. This was one of the first iron furnaces on this side of the Atlantic.



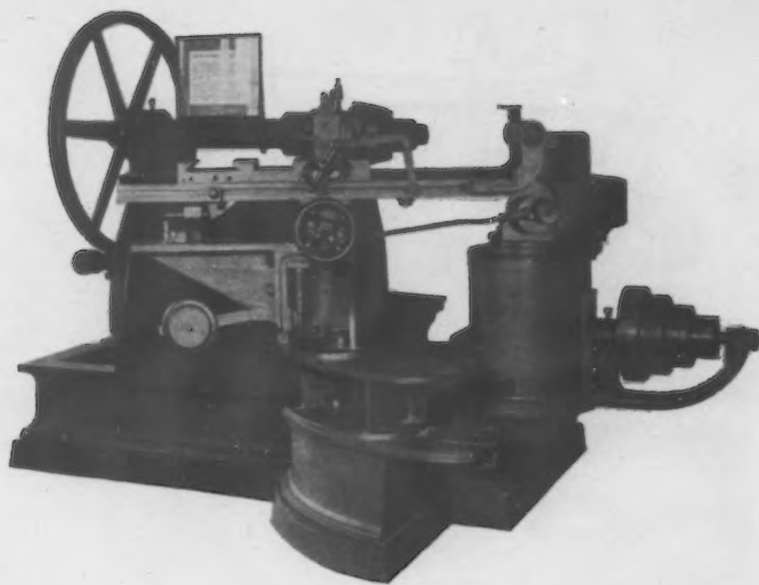
ABOVE, the day book and ledger of the Principio Co., dating from 1726 to 1732, now in possession of the Wheeling Steel Corp'n.

ADVANCED PRACTICE IN KNIFE GRINDERS OF THE EARLY '90's



GRINDING is an art which has received a great impetus from the development of the automobile. Here is a machine, however, which antedates the coming of the motor car by a full decade. It is an early product of the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn. This machine would seem rather light as compared with present day design, but it was an example of advanced practice in 1890.

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 SHOWING THE
 EVOLUTION
 OF BEVEL
 GEAR CUTTERS
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IN 1865, William Gleason founded the Gleason Works at Rochester, N. Y. The business was first devoted to the manufacture of engine lathes, planers and wood-working machinery. Production of machinery for making bevel gears was begun in 1876. The first bevel gear planer, known as "Gleason's Patent Gear-Dressing Machine," is shown above. The evolution of gear-cutting machinery has kept pace with industrial development. The combination testing and lapping machine, shown at left, indicates the great change that has taken place in this branch of industry.

WHEN BROWN & SHARPE WERE WATCH AND CLOCK MAKERS

UNDER the title "The Minor Manufactures of Providence," the PROVIDENCE JOURNAL of May 14, 1855, gives the following description of Brown & Sharpe:

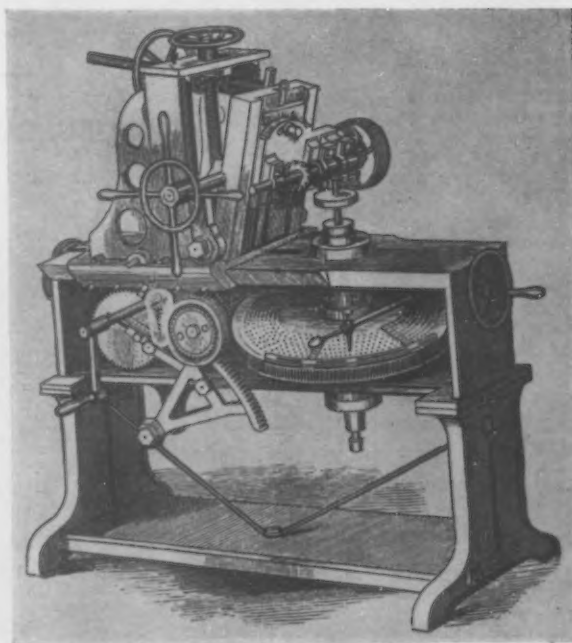
"Messrs. Brown & Sharpe, although principally known as watch and clock makers, in which business they have deservedly acquired a wide reputation, are also engaged in the manufacture of a variety of small machines and tools. In a recent visit to their establishment, we were much pleased with the operation of a straight-line Dividing Engine, of Mr. Brown's invention, for graduating rules and scales, such as are used by engineers, draftsmen and machinists, to whom it is of great importance to have a measure the correctness of which can be relied upon.

"The machine performs automatically, the fact that it is power driven avoiding the imperfections arising from hand labor. Ivory, brass, boxwood and steel rules are divided; divisions as fine as two thousandths of an inch have been made as a matter of curiosity.

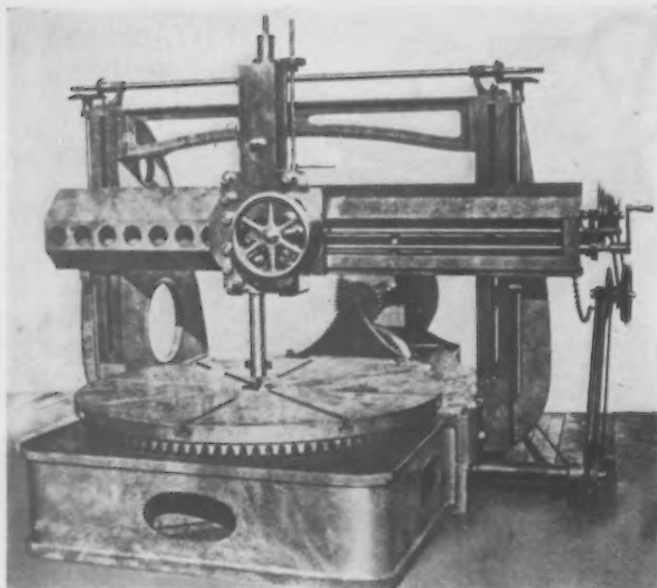
"Among the articles manufactured are the vernier caliper, scales, inside and outside calipers, and points to transfer distances with dividers. With such instruments thousandths of an inch can be as accurately measured and transferred as thirty-seconds by ordinary methods.

"Besides the above, and many other tools, watch pin clocks are manufactured, these being extensively used in manufactories and other places where watchmen are employed. They serve to show that the watchman is attentive to his duty, and that no lapse of watchfulness, even for half an hour, can go undetected.

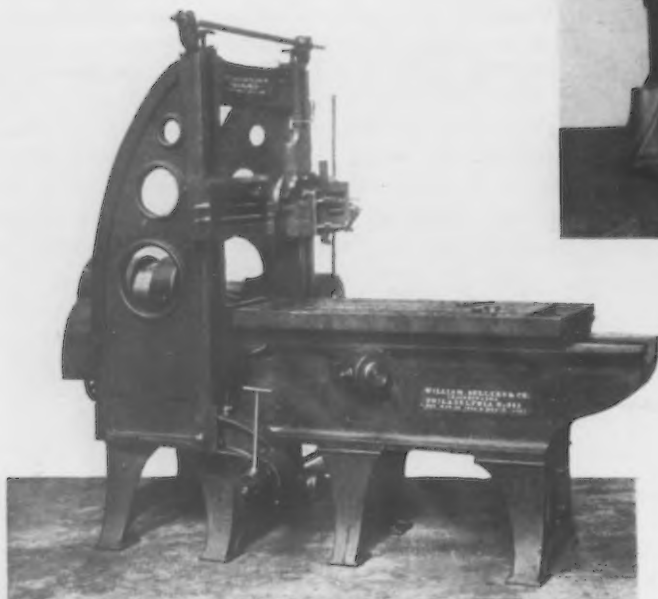
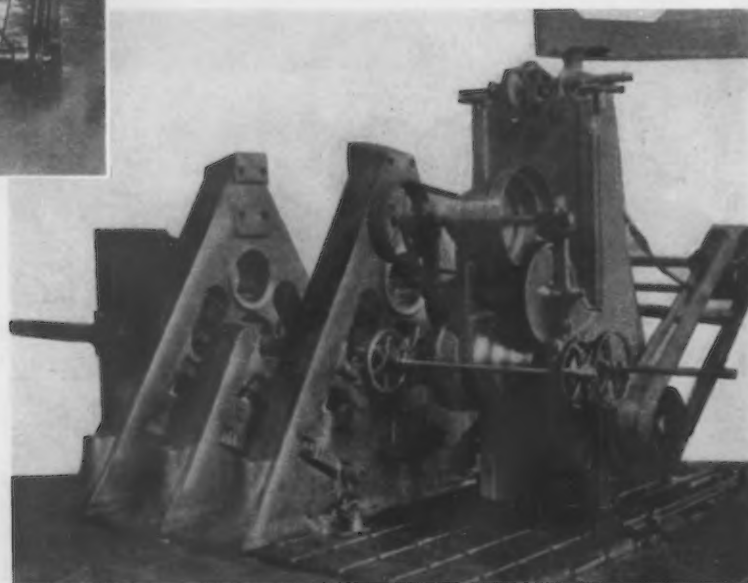
"Lathes and tools in great variety for machinists and watch-makers are also a part of the line of manufacture carried on by this firm."



The Iron Age—75th Anniversary Number—1519



▲ ▲ ▲
EARLY MACHINE
TOOLS OF WILLIAM
SELLERS & CO.
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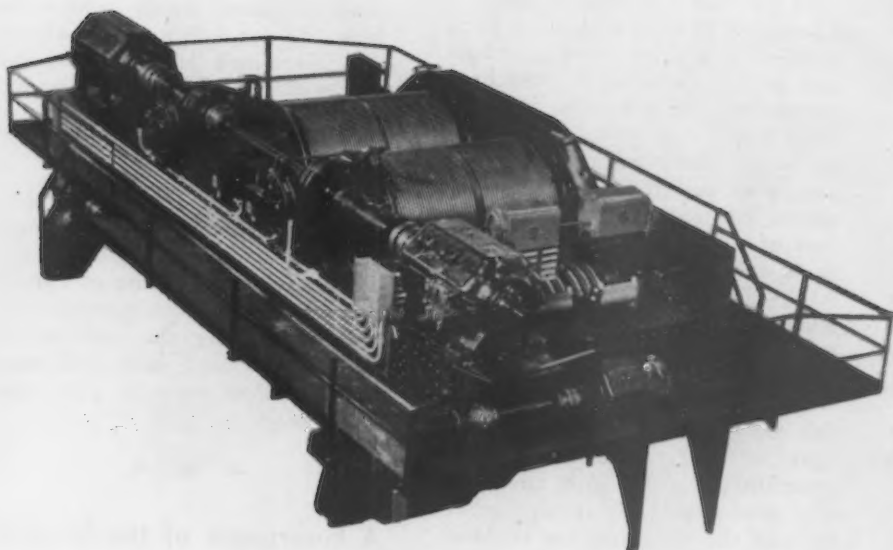
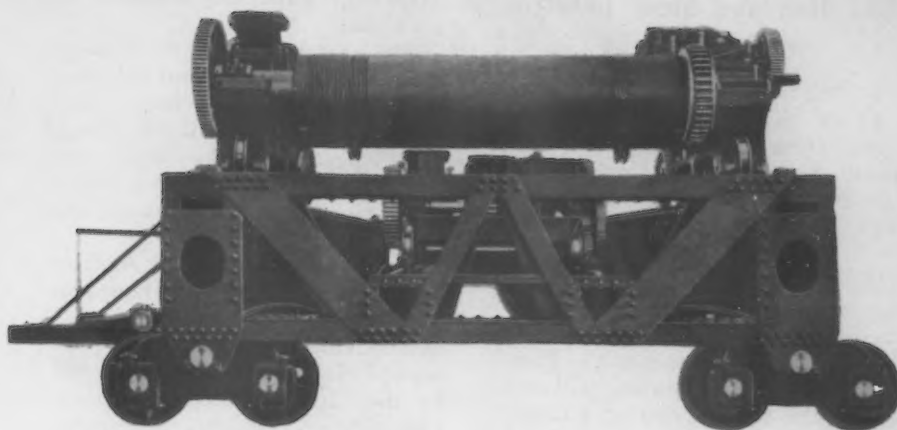
ONE can best appreciate the rapid strides in machine tool design that have been made in this country by examining some of the early examples of the tool builder's art. Here we have a 72-in. boring and turning mill (upper left) built in 1857, a 25 in. x 25 in. spiral-gear planer of 1862, and a floor boring machine of 1870 (above). All were built by William Sellers & Co., Inc., Philadelphia, long before the electric motor began its work for industry.

THE "TUBULOUS" STEAM BOILER OF 1870

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THE firm of Babcock & Wilcox started as a partnership in 1867. One of the early products was this "tubulous" steam boiler of 1870. Fancy lettering and artistic scroll designs were in vogue at that time in the mechanical field, as may be seen from the illustration.
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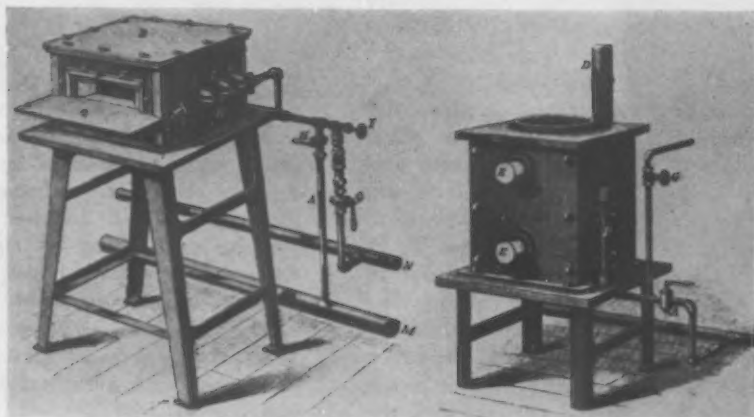
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**FORECASTING
 THE CRANES
 OF
 THE FUTURE**
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AS the Alliance Machine Co. has been established for 28 years, it is in the quarter-century class by a good margin. The two illustrations reproduced here give a good idea of its product evolution during this period. One is a trolley and bridge of an early ladle crane, of 80 tons capacity—a monster of those days. The second picture shows the trolley and bridge of a 275-ton ladle crane just built for the Republic Steel Corp., the largest up to the present time. Fourteen cars were required to ship it. Looking forward to the future, it is the belief of this company that the trend will be toward increased capacities and longer spans, alloy steels for shafting and gearing, and specially rolled H-beams, plates and angles to keep down the ratio of weight to capacity.

HERE ARE TWO EXAMPLES OF EARLY INDUSTRIAL GAS FURNACES

TWO early gas furnaces shown here were 1895 products of the American Gas Furnace Co., Elizabeth, N. J. One is a gas forge, particularly intended for drop forging purposes; the other, a lead furnace for tool hardening. Consistency in the use of gas evidently characterized the company's activities at that time, for it used gas for illumination, for power, and largely for heating, also.



The Iron and Steel Industry in Beaver Falls

THE manufacture of iron or its derivative products has been from its earliest days the most important factor in the growth and prosperity of Beaver Falls, Pa.

In 1801, David Hoopes, a Quaker, purchased the site of lower Beaver Falls or Brighton and formed the firm of Hoopes, Townsend and Company. They erected a sawmill, flouring mill and began the construction of a forge. Before the latter was completed Isaac Wilson bought the entire property. By 1808, a furnace was in operation.

In September, 1808, Isaac Wilson sold a half interest of the lands and manufacturing enterprises to Jeremiah Barker and Isaac Gregg for \$16,000. This firm, under the name of Isaac Wilson and Company, continued to operate the plants until April, 1812, when Barker and Gregg bought out Wilson's interest, borrowing the money with which to pay him from Oliver Ormsby of Pittsburgh.

Barker and Gregg apparently did not make enough profit in their venture to pay the interest on their indebtedness so Oliver Ormsby, their creditor, soon issued an execution and sold the lands and business at sheriff's sale, he becoming purchaser.

He continued the manufacture of the iron and other products under the supervision of Colonel John Dickey and James Glenn until 1818. This year saw a general prostration of business in the country and all these enterprises lay idle for a time.

In 1829 James Patterson purchased the lands and buildings from Ormsby but in time the Patterson impetus lagged and Robertson's paper mill was the only thriving workshop in Beaver Falls.

After another lawsuit, Patterson continued his work of improvement. He opened the cotton mill and built a grist mill. But if he did anything toward the reoperation of the forge and furnace, it must have been of a desultory character for no mention is made of it in the history he wrote and in others he inspired. If he did the panic of 1837 put a stop to it.

In the early '50's Marcus T. C. Gould induced eastern capital to take an interest in the valley. The result was a corporation called the Beaver Manufacturing Company, a promoting organization that promptly put the furnace and the

other idle Patterson industries in operation.

But the panic of 1857 swept them all into failure and the town dropped into a slump from which it did not recover until the Economites purchased the tract and began to put money and inject vigor into the community—ten years later.

In the spring of 1888 Andrew Carnegie purchased the Hartman plant and the operating name became Carnegie, Phipps and Company, Ltd., to be succeeded in 1895 by the Carnegie Steel Company, Ltd. Three years later it became the property of the American Steel & Wire Co., and operations under this name were discontinued in 1899. The United States Steel Corporation assumed ownership in 1901 and the plant was dismantled.

It was not a profitable concern. Carnegie, Phipps and Co., Ltd., learned this after their purchase and soon dismantled the merchant bar mills. By reduction in operating costs they were finally able to break about even, but it was chiefly of use to the Carnegie interests as a consumer of the products of the Homestead and Brad-dock mills of the same company. Also, Hartman sold the Marginal Railroad to the Pennsylvania at a large profit, which was another blow to the owners of the plant.

Two great strikes occurred at this works, one in 1884 and the other in 1892. The latter was a sympathetic strike with the men who had gone out in the other mills of the same concern in Allegheny County, resulting in what was called the "Homestead Riots."

The business men of Beaver Falls broke the last strike. It did not appear to have any reasonable cause for existence. A mass meeting was held at the Sixth Avenue Theater where the officials of the steel company were assured that if they reopened the plant, which apparently had been closed for good, their workmen would be given protection. Upon this guarantee operations were resumed.

The cold drawn steel department was in charge of W. A. McCool, Sr., who had invented the process. At the time of the Hartman sale to Carnegie, the manufacture of steel signs, fencing and cold drawn steel was discontinued. Hartman started another factory for the production of signs and fencing and McCool began one for the making of cold drawn steel.

The latter was incorporated in 1888 as the Union Drawn Steel Company, with a capital of \$200,000.

How the Self-Opening Die Head Originated

THE Geometric Tool Co. was organized on the foundations of an older company known as the Geometric Drill Co., which was incorporated on March 28, 1893. Organized by William S. Smith and financed by the four Beecher brothers of match machinery fame, the Geometric Drill Co. first made drills to make irregular holes in metal. This was an ingenious device, but impractical.

In 1894, the late Howard E. Adt, was taken into the company as manager. He immediately changed the product of the company to something in more demand—a device to cut threads on metal. This device cut threads with a set of chasers or cutters, these chasers being withdrawn from the cut automatically after a pre-determined length of thread has been cut. Thus it was unnecessary to reverse the spindle of the machine to get the cutters off the thread.

Right here was born the well-known "Geometric" self-opening die heads and collapsing taps. They advanced the art of cutting threads and were an important factor in reducing the cost of all things that used bolts and nuts and threaded parts in their construction.

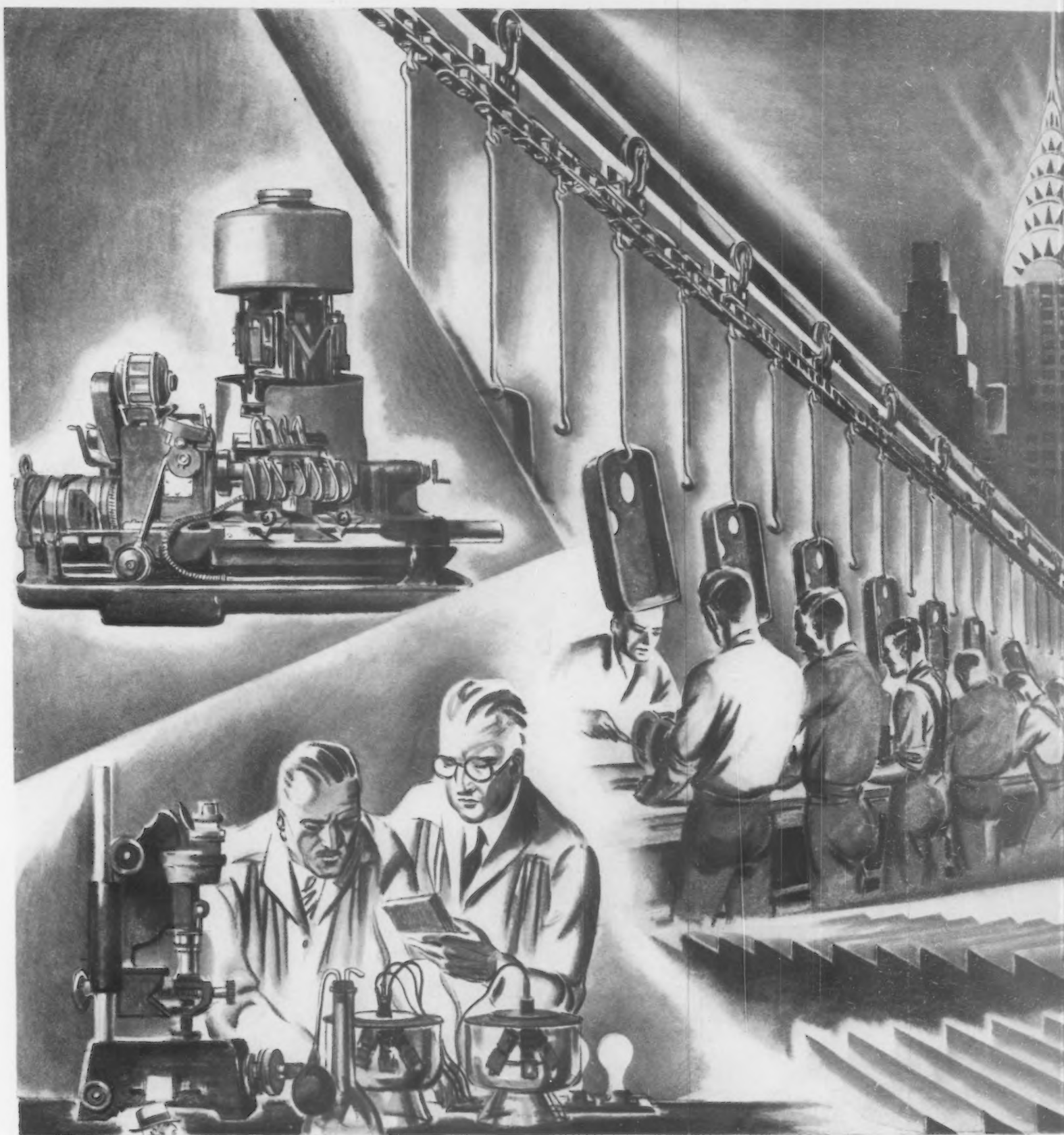


A Forerunner of the Modern Assembly Line

IN its early days, the V. & O. Press Co., Hudson, N. Y., was approached by Sylvanus Lock, who had conceived the idea of making a detachable sprocket chain link from sheet metal. He desired to have the necessary dies made for the production of this link.

Mr. Osswald, who is now vice-president and chief engineer of the V. & O. Co., proceeded to design a machine which manufactured and assembled the links automatically. The process produced no scrap loss; a coil of strip steel stock passing through the press and emerging as a finished chain.

The value of this process to industry at that time (1892) was considerable, and this development may be said to be a forerunner of the modern assembly line, which is based on the use of chain transmission.



...1930...

✦ Modern Industry as we know it today. Mass production, automaticity, research, huge manufacturing plants, giant power. Contrast this symbolization of 1930 with the crude physical labor of 1855, as depicted in the painting representing that period. ✦ Mechanical movement is the keynote of production today. The work moves, but the workmen stand still. Materials handling developments



industry as we know it today. Mass automaticity, research, huge manufacturing, giant power. Contrast this symbol of 1930 with the crude physical labor of the past. The mechanical movement is the keynote of the future. The work moves, but the workman still. Materials handling developments

of the past two decades have transformed industry; knit together the isolated activities of past practice into a coordinated mechanism of vastly improved efficiency. ✚ What of the future? There is no doubt that those who come after us will regard the methods and accomplishments of 1930 as we do those of past decades. For we are just crossing the threshold of accomplishment.



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A Business Card of 1850

THIS business card, dated 1850, gives a list of prices of that day for various iron products. It was issued by the old "Top Mill" located at First Street in Wheeling, W. Va. At that time, however, the old mill was known

use of high-pressure steam, and in high rotative speeds. He originated, in 1882, the diverging steam nozzle, which he used in connection with his first turbine, and which is now universally employed. His early turbines operated at speeds as high as 50,000 r.p.m. Having brought his steam tur-



A
PRICE LIST
OF
1850

as the Missouri Iron Works, because of the fact that the ore used in the production of iron came from Missouri.

He Pioneered in High-Pressure Steam

THE history of the De Laval Steam Turbine Co. does not go back to the date of founding of THE IRON AGE, but it does cover half of that period. The products and history of the company originated in the pioneer engineering accomplishments of Carl Gustaf Patrick De Laval, who was born in Sweden in 1845.

De Laval's first two inventions were a device for the distribution of air in pneumatic steel converters, and a crucible for galvanizing. One of his best known inventions is the centrifugal cream separator, which followed shortly after, and which has become the basis of a large business.

De Laval was a pioneer in the

bine to a commercial success, De Laval turned to the problem of increased steam pressures, and in 1897, at Jarla, Sweden, attained, for the first time in history, a commercially practical steam pressure of over 3000 lb. to the sq. in.

Heads Company for More Than 40 Years

F. PHILIPPI, president of the Excelsior Tool and Machine Co. of East St. Louis, Ill., has a long record as the chief executive of that company. He occupied the same position back in the '90's, at a time when the entire plant was smaller than the company's present office building.

The company builds a diversified line of metal-working and other machines and also supplies forgings and castings. It furnished the slides and gate guide castings for the Panama Canal locks, weighing a total of 1,200,000 lb.

Footprints of Progress on the Sands of Lake Michigan

IN the early 'nineties the founders of the Inland Steel Co. saw an opportunity in the growing need of the Central West for steel. In 1893, the company was established as a rail-rolling mill in Chicago Heights. The Tacoma Building in Chicago—the first building in the world to use the skyscraper principle of construction—had gone up in 1889 . . . had set a new style in architecture. The Chicago World's Fair had been held in 1893 and its success was an inspiration to the leaders of Chicago and the Central West. The result was a program of activity in all fields. The Inland Steel Co. foresaw the growing needs of the territory, and so in 1901 it bought a tract of undeveloped and unimproved land in what is now the city of Indiana Harbor. Here was room to grow as well as good transportation for its raw materials and the shipment of its finished products; and a plentiful labor market was at its elbow in Chicago. Presently this tract was covered by four open-hearth furnaces, a blooming-mill, a bar-mill, eight sheet-mills, and a jobbing-mill.

With these relatively meager facilities, the company started producing steel late in the year 1902.

Today, in Indiana Harbor Inland has nearly one thousand acres now occupied by four blast-furnaces, 278 by-product coke-ovens, 27 open-hearth furnaces with a capacity for producing 2,000,000 tons of steel ingots annually.

Buffalo Wire Works Co., Inc., Goes Back to 1869

MARTIN SCHEELER, SR. in 1869, founded the business that today still remains in the Scheeler family. At that time however, the name of the company was Scheeler and Sons.

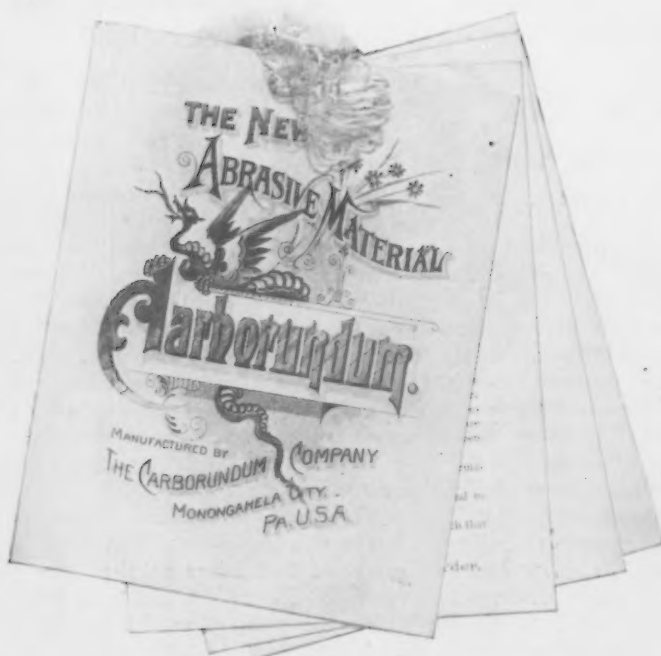
The first little factory of the company resembled a small barn, having some eight windows and one door. A modest "stove pipe" stack protruded from the roof. Certainly a modest beginning for a business that has grown to its present line of more than one thousand different kinds of wire products.

These products vary from the finest silk-like wire cloth with a mesh of 200 wires to the square inch to the bullet resistant wire cloth for protection against banditry.



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A
GRAPHIC
EXAMPLE
OF
GROWTH
▼ ▼ ▼

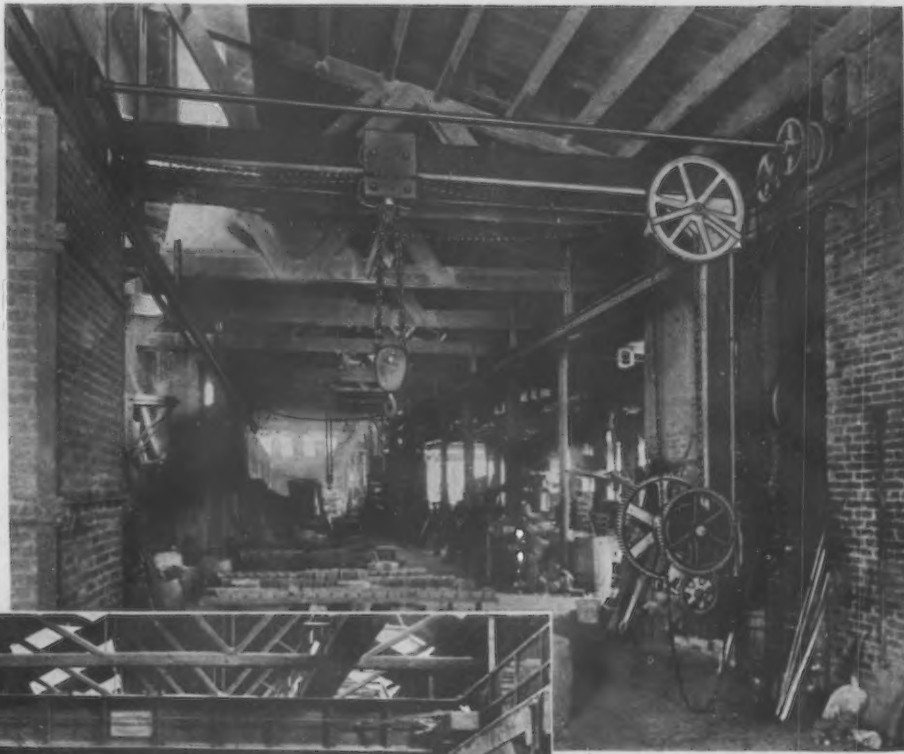
THESE illustrations show the first stockroom of the Morse Twist Drill & Machine Co., New Bedford, Mass., as of 1864, contrasted with the present day stockroom. The small case which served that purpose, at the time the company was established, was designed to hold all of the goods required to be held in stock. The capacity of the electric truck, shown in the foreground of the modern stockroom, is greater than was the entire stock case used in 1864.



FIRST "CARBORUNDUM" CIRCULAR LOOKED LIKE DANCE PROGRAM

BACK in 1893, in the early days of Dr. Acheson's work, the chief use of his new abrasive was as a substitute for diamond dust for the rough polishing of precious and semi-precious stones. In fact, the first circular issued by the Carborundum Co., reproduced herewith, dealt with its adaptation to this purpose. Today, the products of the company are being used in practically every industry.

▲ ▲ ▲
BEFORE
THE
DAYS OF
THE
ELECTRIC
CRANE
▼ ▼ ▼



THESE prototypes of the electric traveling crane were built by the Box Crane & Hoist Corpn., Philadelphia, an old-time organization, which also introduced the double-screw chain hoist in 1879. The crane (above) is hand powered by chains. New electrified crane originally driven by endless rope (left).

IN THE EARLY DAYS OF WIRE ROPE THEIR FACTORY
WAS THE OPEN PRAIRIE

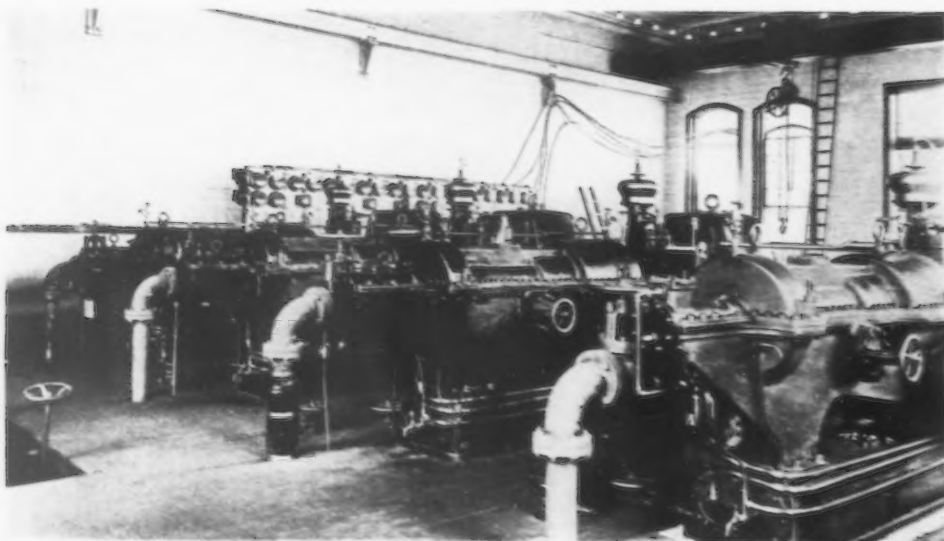
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ALTHOUGH the company did not begin the manufacture of wire rope until 1880, A. Leschen & Sons Rope Co., St. Louis, dates back to 1857. At the time they started in the rope business, the hand method was in use. The open prairie was their factory and hence the length of the factory could be made to accommodate whatever length of rope was required. The illustration shows the old hand method of twisting the rope, the two men shown still being on the company's payroll, after 50 years of service.
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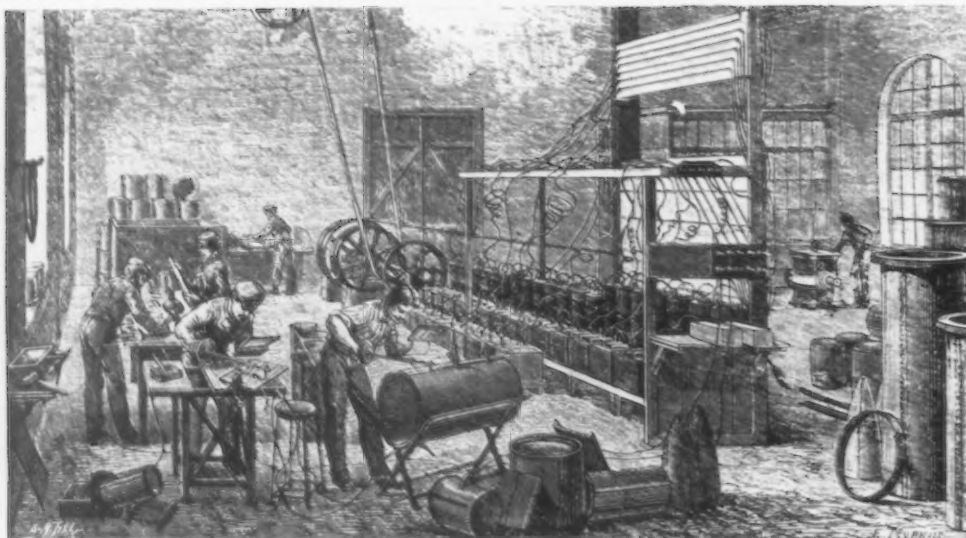
WESTINGHOUSE IN THE PIONEER DAYS OF ELECTRICAL DEVELOPMENT



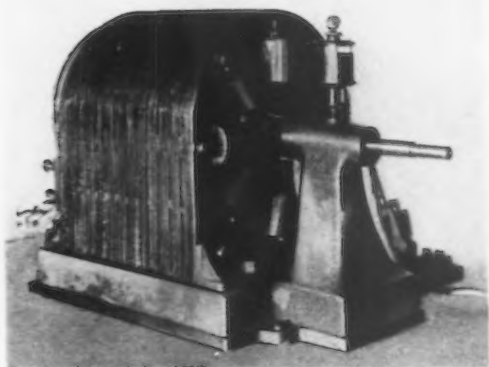
VIEW of the Westinghouse Electric & Mfg. Co., East Pittsburgh, taken in 1895. Where the cows are contentedly chewing grass now stands the world's largest arc-welded building.



THIS is said to be the first serious installation, in America, of turbine-driven generators for industrial use (left). The three 400-kw. steam turbines shown were installed at the Westinghouse Air Brake plant at Wilmerding, Pa.

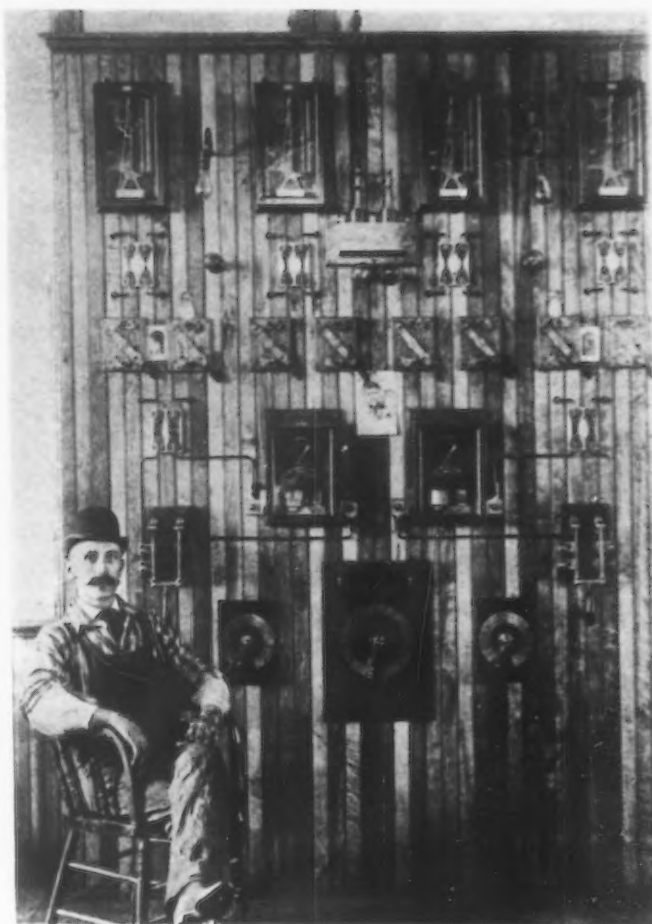


THIS is the way an electric-welding shop looked in 1887. Business seemed to be pretty good, judging from this picture.

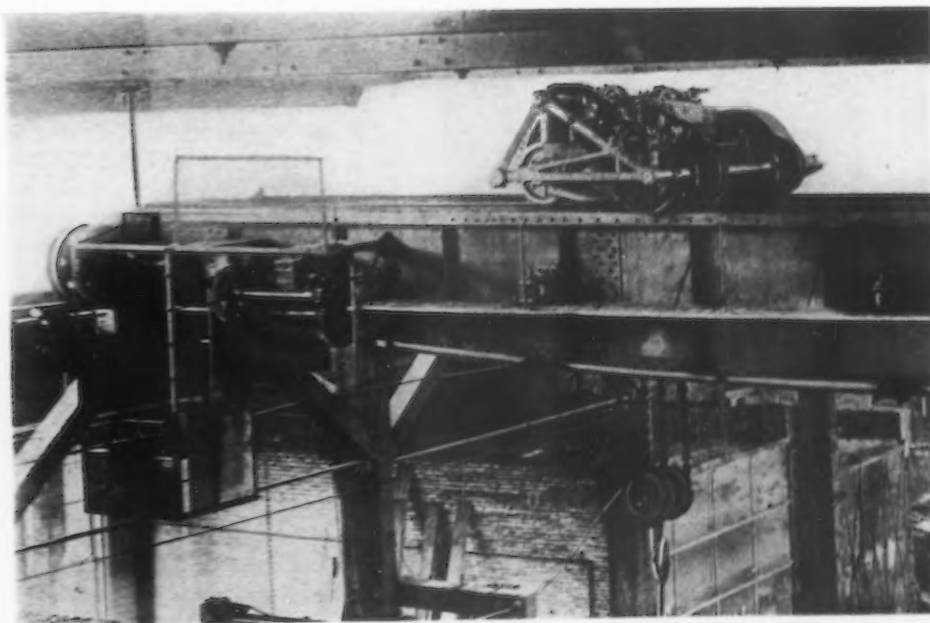


HERE is the granddaddy of all induction motors. It was made by Tesla, as an experimental model, at the Westinghouse works in 1888.

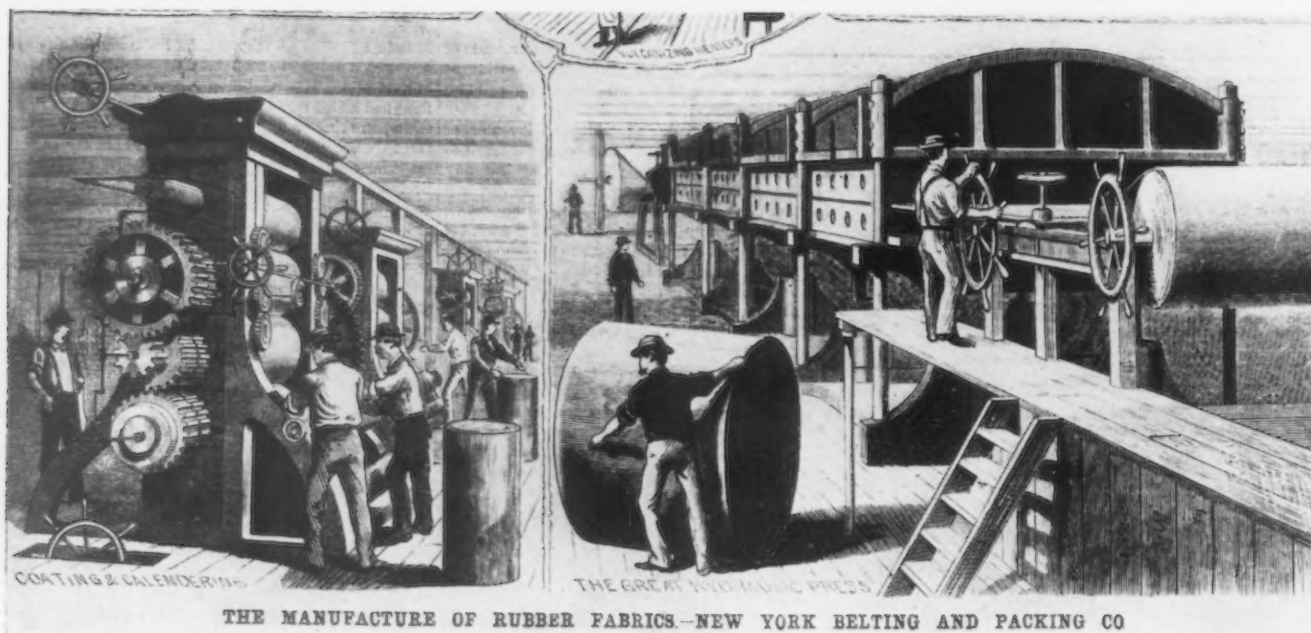
HOW the name "switchboard" originated. In 1890, it was merely a board with switches, presided over by a proud attendant with the inevitable moustache, hard hat and congress shoes.



AN EXAMPLE OF OVERHEAD CRANE DESIGN IN THE EARLY DAYS OF MOTORIZATION



CONSIDERING that the electric motor did not come into industry until about 1880, this electric travelling crane must indeed be one of the old timers. It was of 25 tons capacity, built by Pawling & Harnischfeger, Milwaukee, and installed in the plant of the Allis Co. (later Allis - Chalmers). This was a three-motored crane.



NEW YORK BELTING & PACKING CO., 1846-1930

FOUNDING of the New York Belting & Packing Co. dates back 84 years, the business having been established shortly after Charles Goodyear was granted a patent on the vulcanization of rubber. The original factory was located at Sandy Hook, Conn., on the old Housatonic Railroad. The illustrations above show some of the machinery in use at that time. Many

of the fundamental processes for fabricating rubber which were developed at this plant are in effect throughout the industry today.

Factory of the company is now at Passaic, N. J. When the program of improvements is complete it will be the largest plant devoted to the manufacture of mechanical rubber goods.

A RECOLLECTION OF THE DAYS OF THE "STOVE-PIPE" HAT



A PICTURE from the "good old days" of the mauve decade in the nineties, when stove-pipe hats were worn by exhibitor-salesmen. The picture shows the display of the St. Paul Roofing & Cornice Co. in the national building exhibition at Royal Agricultural Hall in London, in March, 1891. The Saint Paul Corrugating Co., St. Paul, Minn., the same company, though with name changed, began fabricating sheet metal in St. Paul in 1885.

Such material was largely used in the period which preceded the age of stucco in construction work. Many store fronts, shops and other buildings in the Northwest, particularly in North Dakota, were made of material fabricated by this company. The man in the picture, wearing the cutaway coat and the stove-pipe hat, is W. Nelson, an expert draftsman at that time in the company's employ.

▲ ▲ ▲

PIONEERS IN HANDLING AND TRANSMISSION

▼ ▼ ▼



THE story of the Link-Belt Co. goes back to 1875. William Dana Ewart, a young implement dealer of Iowa, first saw the possibilities of a chain drive for self binders. The idea came to his mind while in church one Sunday and, before the sermon was finished, Mr. Ewart had worked out the idea of the square detachable link. The Link Belt Machinery Co. was incorporated in 1880, to apply this drive to elevating and conveying machinery. Mr. Ewart was its president.

The colorful personality of one of his associates, James Mapes Dodge, inventor of the Link-Belt silent

chain, the Dodge system of coal storage, etc., pervades the early history of the company, and particularly of its Philadelphia activities. Mr. Dodge was, to quote Charles Piez; "a ceaselessly active, dynamic man, eternally in quest of progress, yet thoroughly human and with a never failing sense of humor." He had rare ability as a raconteur, and this unusual picture shows Mr. Dodge telling one of his stories to his fellow executives—perhaps this being the forerunner of the "conference" so popular in business today.

▲ ▲ ▲

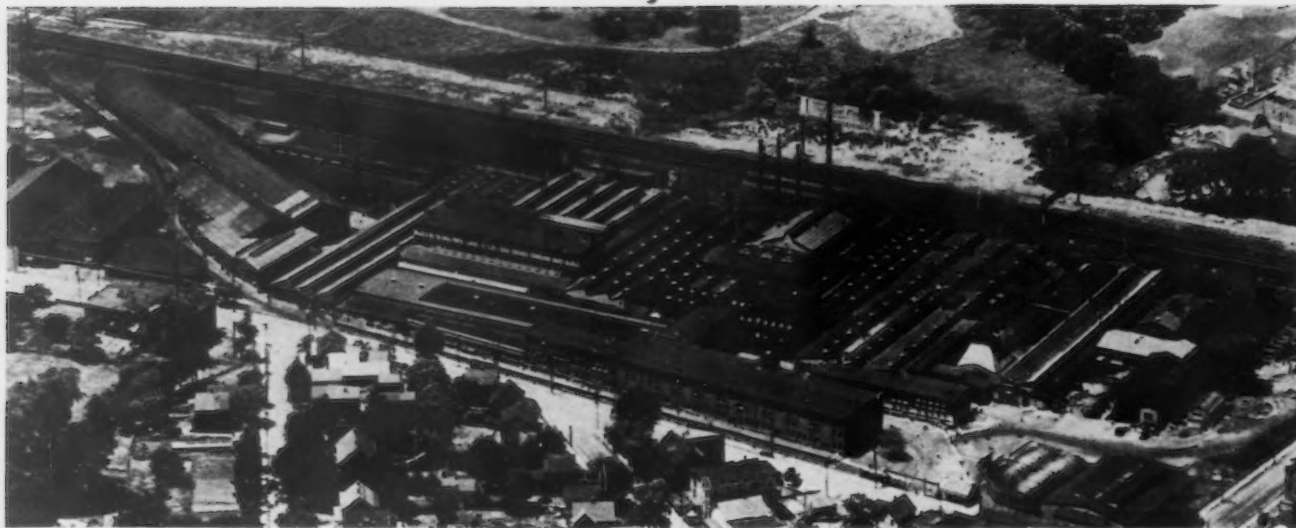
THE OLD AND THE NEW IN OXWELDING

IN 1895 Le Chatelier, a French chemist, found that acetylene, when burned with an equal volume of oxygen, had a flame temperature of about 6000 deg. F. Here was a source of heat that would make an ideal method of joining metals, since it was much above their melting point. But the process was merely a laboratory curiosity until acetylene and oxygen were available commercially.

Edmund Davy first produced acetylene in 1836, in experimenting with potassium. It remained for Willson, however, to discover the electric process of calcium carbide production, in 1892. As a result of his experiments, the first factory in the world for the commercial production of calcium carbide was put in operation in 1895. This year also witnessed the successful operation of the first liquid air machine, the forerunner of the present process for making oxygen.

The Linde Air Products Co. supplied these illustrations, one of which shows a torch of the early days while the other shows the recent application of oxwelding to the hard surfacing of parts exposed to abrasive wear.





SERVICE AND GROWTH CHARACTERIZE EIGHTY-SIX YEARS OF BOLT MAKING

THE IRON AGE is not alone in celebrating an anniversary this year. At least one of the businesses it is privileged to serve antedates it by ten years. The Russell, Burdsall & Ward Bolt & Nut Co., one of the largest and best known firms of its field, is now in the eighty-sixth continuous year of its existence.

Eighty-five years is a mature age for any business, especially in America, reputedly so lacking in tradition. Russell, Burdsall & Ward not only have weathered the stupendous changes wrought during that time and emerged sounder and larger than ever, but the company is still in the hands of the self-same families that started it in 1845.

All too frequently does tradition hem in, make for ultra-con-

servatism—but not in the case of Russell, Burdsall & Ward. The tradition is there—and it makes itself felt the minute you step into one of the three huge plants, the minute you have any dealings with the company—but it is balanced and supplemented admirably by a most refreshing spirit of youth and modernism.

Glimpses of tradition: An entire wall in the company's office occupied by pictures of "Men and Women Who Have Been With Us for Thirty Years or More." . . . Elderly, but hale and hearty mechanics, their gray hair thinning, bending over precision work, their jobs secure, their loyalty unquestioned. . . . Signs reading "Tell the Truth" scattered everywhere, even as far as outlying garages. . . . The plant at Port Chester that

"just grew," with addition after addition.

Glimpses of the New: Youngish executives who have risen from the ranks . . . a testing laboratory where bolts and nuts are torn apart . . . "The Machine Gun," a machine that turns out 1100 nuts a minute, uses $8\frac{1}{2}$ tons of steel a day . . . acres of stockroom with roller conveyors, like a railroad switchyard . . . a machine that nails up a case of bolts at the touch of a lever.

Perhaps there is no great merit inherent in tradition itself, no wisdom and no reason for success; but when tradition is tempered and blended perfectly and harmoniously with modernism, with an open mind—then the result can be a great business institution of permanence.

▲ ▲ ▲ ABOVE, the Port Chester, N. Y., plant of the company. At the left, below, the plant at Coraopolis, Pa., and at the right, the Rock Falls, Ill., plant. ▲ ▲ ▲



1895

1900

1905

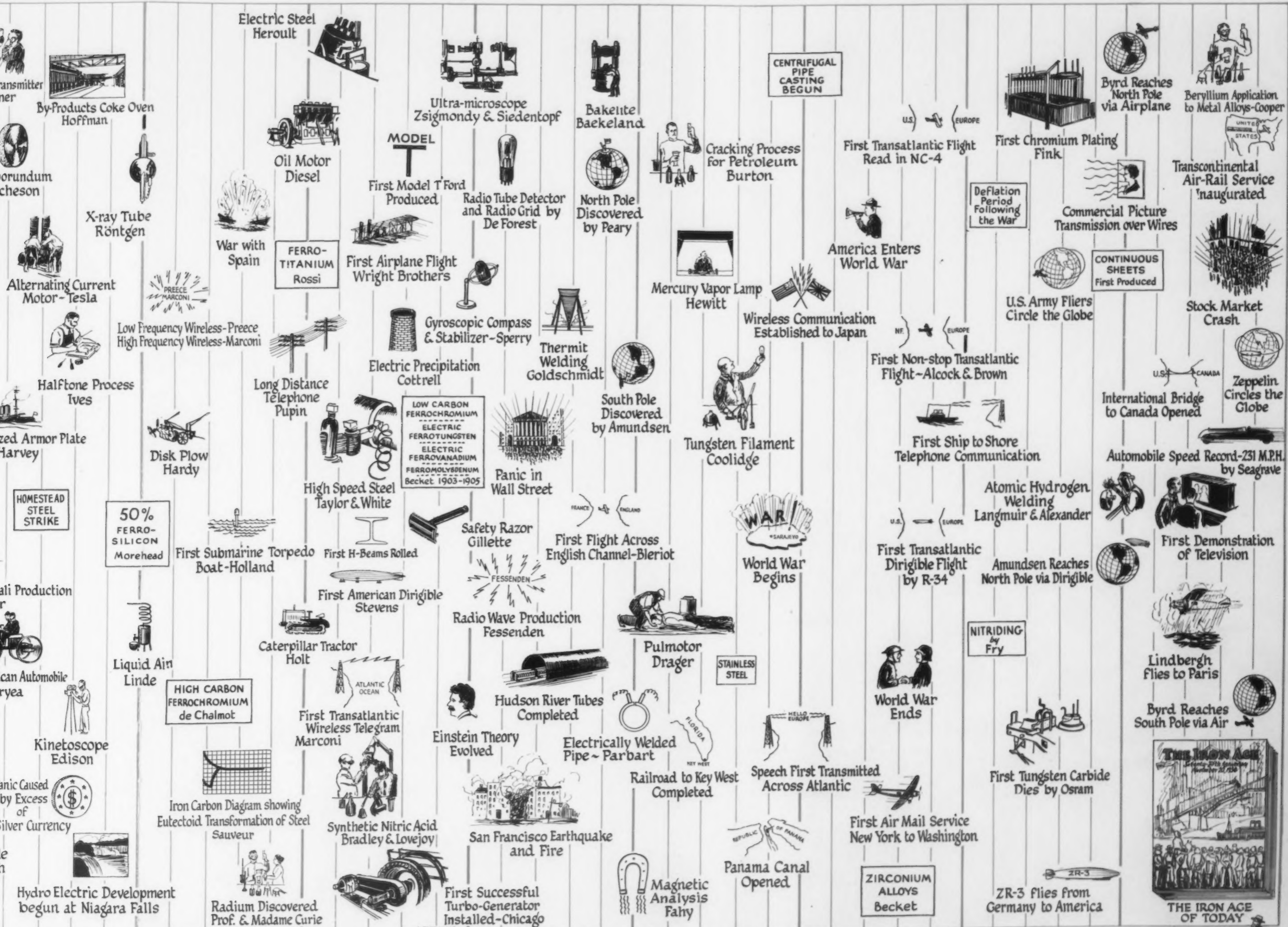
1910

1915

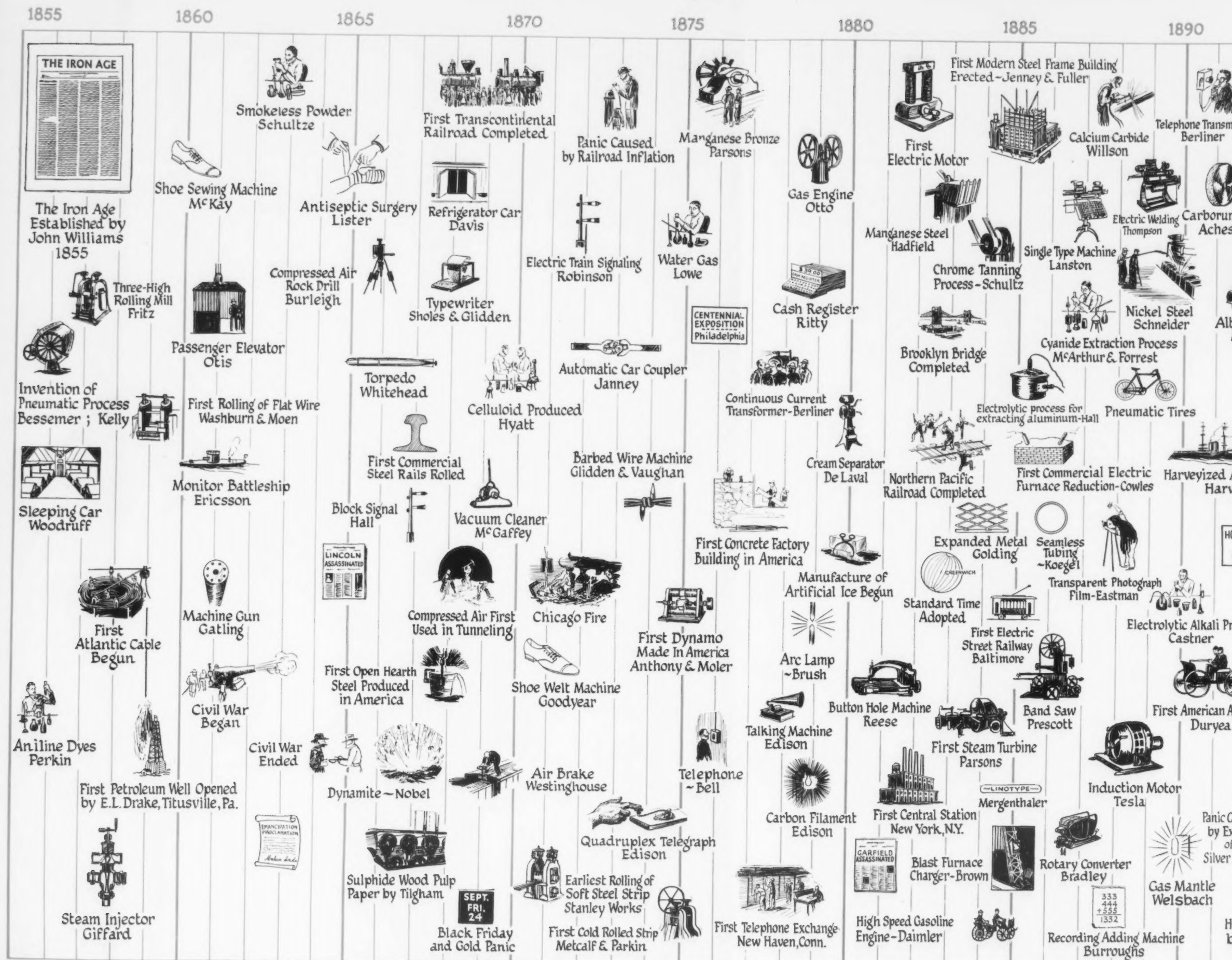
1920

1925

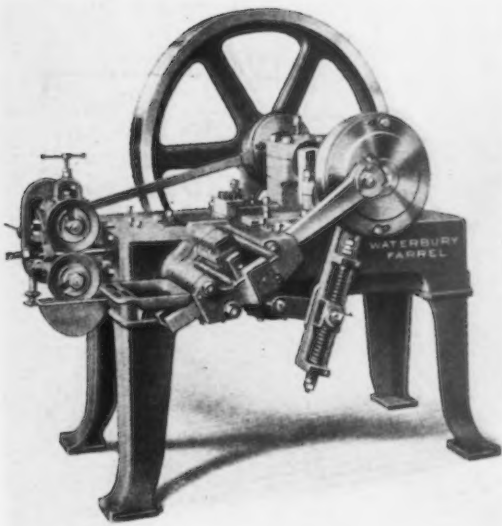
1930



LIFETIME · OF · PROGRESS ·



• • MILESTONES • IN • A • LI



HALF CENTURY COMPARISON OF RIVET MACHINES



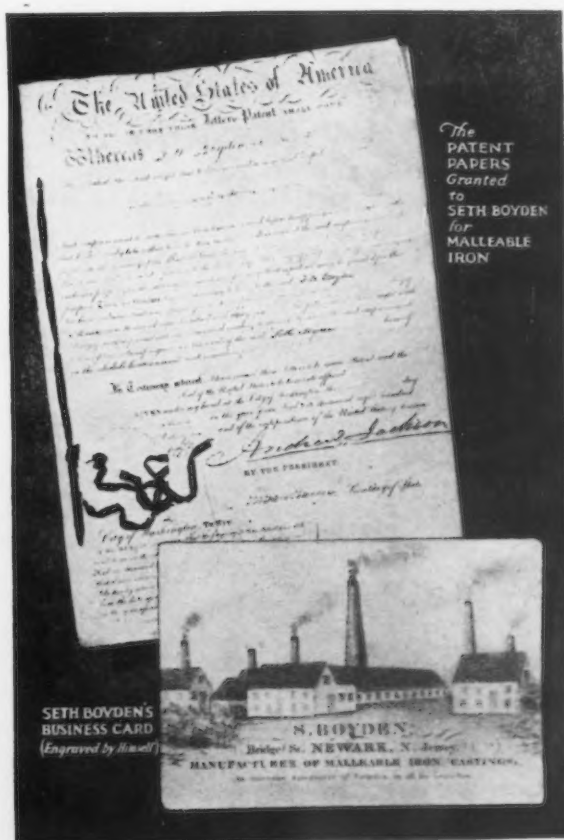
IN many cases one will note considerable change in the general type of a given product of today and of fifty years ago. Here is a case in which there is a very strong type resemblance between an 1875 rivet machine and the present day model.

The reason for such instances is that the designer of the original machine anticipated his times and produced a machine on basic principles that were funda-

mental. In such cases the modern product follows the older product in general design but of course with many improvements in details.

These machines represent one of the products of the Waterbury-Farrel Foundry & Machine Company, of Waterbury, Conn. This company was organized in 1851, and is therefore in the three-quarter century class.

BARLOW FOUNDRY, INC., DATES BACK TO 1826



ON July 4, 1826, while most of his fellow citizens were busy celebrating the fiftieth anniversary of the signing of the Declaration of Independence, Seth Boyden was hard at work in a makeshift foundry that he had built back of his harness establishment in Newark, N. J.

The work of that eventful day brought him the reward of several years of patient effort—a product equal to the best English malleable iron. This gave the young United States a valuable new metal, for its process of manufacture abroad had been a carefully guarded trade secret.

After conducting his foundry business for nine years, Mr. Boyden became interested in other projects and the business came under the control of Daniel Condit and John H. Barlow. The business has continued without interruption ever since, and celebrated its centennial in 1926.



FIFTY years ago, before the coming of unloading machinery, stevedores "walked the plank," as shown above. Then came the first Brownhoist unloader, invented in 1880, as shown in the picture at the right.



▲ ▲ ▲
EVOLUTION
IN
COAL
AND ORE
HANDLING
▼ ▼ ▼

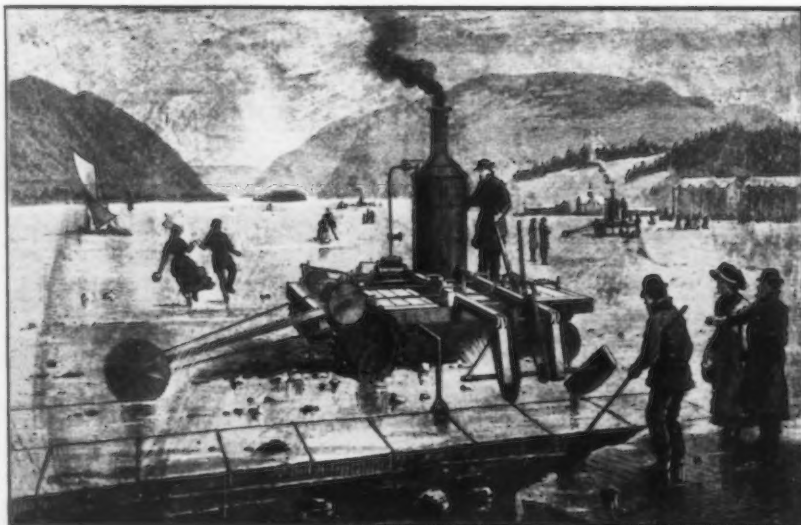


AT the left is a modern ore unloading bridge, as built by Brownhoist. It accomplishes, in minutes, the work that required hours in the "good old days."

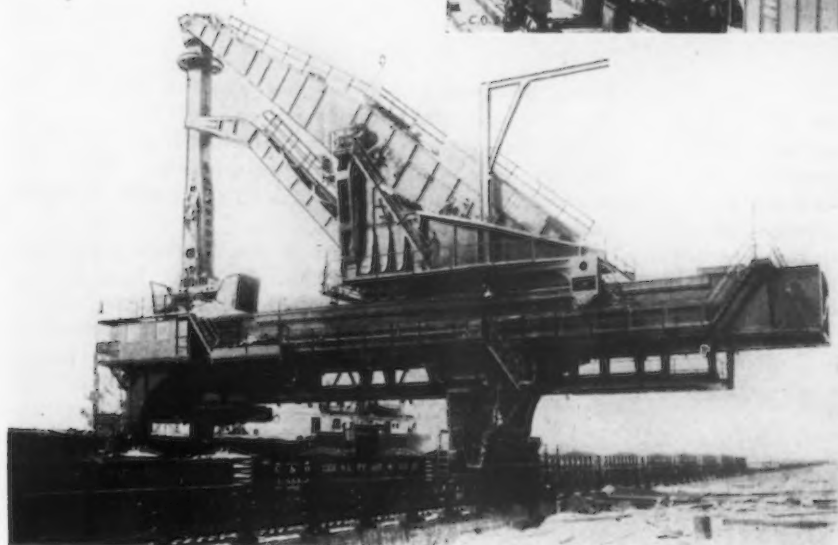
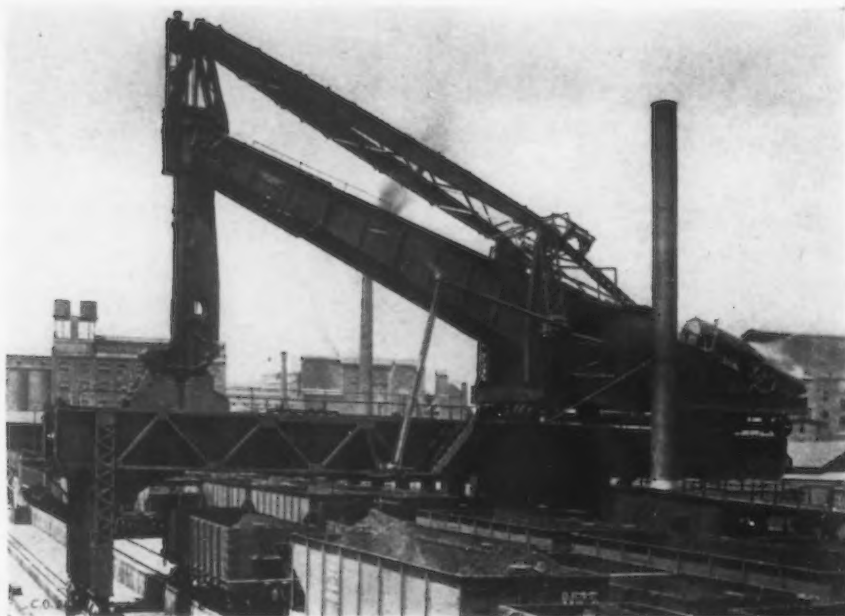
HEADS COMPANY ESTABLISHED BY HIS GREAT GRANDFATHER

ONE hundred and sixteen years ago, in 1814, Elihu Gifford founded a company which has progressed continuously since that time, and which is now headed by his great-grandson, Benedict Gifford—the Gifford-Wood Co., Hudson, N. Y. In those early days the company's entire business consisted of supplying castings and ice tools to the river ice harvesters.

Today, the manufacture of ice-handling equipment is still a part of the business. The illustration shows one of the company's early steam ice harvesting machines at work. Efficiency was evidently in order, even at that day, for the saws are cutting both ways at once.



▲ ▲ ▲
MACHINES
WHICH HAVE
ALTERED
THE COURSE
OF INDUSTRY
▼ ▼ ▼



IN the early days, iron ore from the upper Great Lakes region was loaded into boats built for other purposes and was unloaded laboriously at the lower Lake ports, by the crudest sort of machinery.

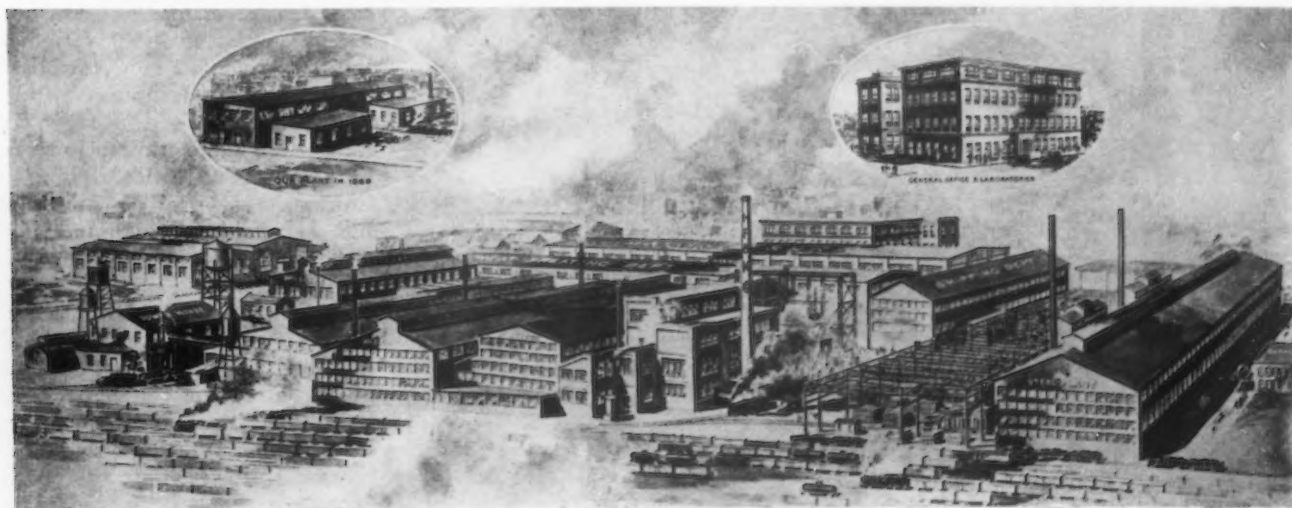
Then came the stiff-leg unloader—which reached into the hold and brought out the ore at a surprising speed. The result of this was that the development of mines followed on a huge scale, and an entirely new design of ore boats was developed.

Above is shown the stiff-leg steam-hydraulic unloader, developed by the Wellman Engineering Co., Cleveland, which was instrumental in effecting this change in the ore industry. It had a capacity of 10 tons. At left is a modern electrically-operated Wellman unloader of the Hulett type, of 17 tons capacity, with 50-ton disk hopper. This machine has eight motors totaling over 1000 hp.

A GRAPHIC EXAMPLE OF 30 YEARS OF GROWTH

OUR American atmosphere of progress is conducive to rapid plant growth, when products and policies are intelligently guided in the direction of fulfilling industrial needs. Little shops become huge industrial

plants within comparatively short periods. This picture shows the growth of the Heppenstall Co., Pittsburgh, from small beginnings in 1899, 10 years after it was founded, to its present impressive size.





TWO HUNDRED AND THIRTY-FIVE YEARS IN THE IRON AND STEEL BUSINESS

SHORTLY after the Duke of York ousted the Dutch Magistrate and granted Jersey to Lord Berkeley, and at about the time the first newspaper in America was founded, George Ryerson and a syndicate purchased 6000 acres of land in the northern part of the (future) State. In 1695 the development of this tract for agricultural purposes was begun, but, ore beds

being discovered, Mr. Ryerson and his friends began to work iron mines in this region.

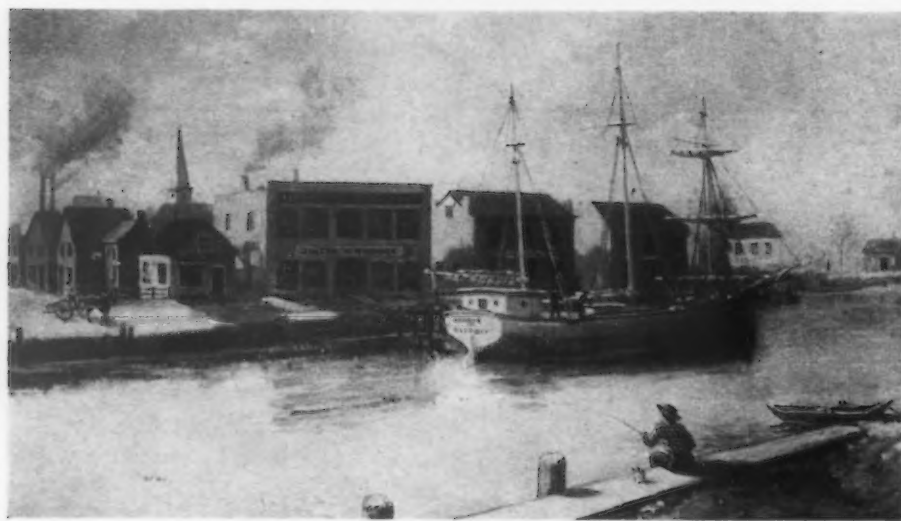
In the next generation, Martin Ryerson, a son, further developed this iron production. Some of it was used for munitions for defense against Frontenac and his red-skinned allies.

The Iron Hill Mine, one of the Ryerson group being operated in 1740, had as much as 8000 tons taken out of it. The ore was melted in the furnace shown at left by placing a layer of coal or charcoal and a layer of ore until the old stone structure was full. The fire was then started and kept going by means of forced draft from a huge bellows operated by a waterfall.

Ryerson mines and furnaces played an important part in the Revolutionary War, supplying the Colonial Army with great quantities of munitions and material. Part of the chain which was stretched across the Hudson at West Point, to prevent the British ships from going up the river, was forged at Ringwood, a Ryerson property.

The family entered the wholesale dealer business in finished iron products in 1790, Thomas Ryerson, Martin's son, establishing a store or warehouse in Philadelphia. His son Joseph, in turn, made the eight-day journey in 1842 from Philadelphia to Chicago, a town of 6500 people, and there laid the foundations of the present business of Joseph T. Ryerson & Son.

Since that time the business has expanded rapidly, and branches have been established or acquired in many cities. Donald M. Ryerson is the present chairman of the board and Edward L. Ryerson, Jr., its president.





▲ ▲ ▲ PRODUCTS OF A 70-YEAR-OLD STEEL PLATE MANUFACTURER ▲ ▲ ▲

ABOVE represents some of the modern plate products of the Central Iron & Steel Co., established in 1860 at Harrisburg, Pa.

PRODUCTS GROW IN SIZE WITH PLANT DURING A HALF CENTURY ▲ ▲ ▲

ONE of the members of the "half-century" class is the Toledo Machine & Tool Co., Toledo, Ohio. Henry J. Hinde, president, has been its leading figure since shortly after its inception. During his association with the sheet metal-working industry he has seen a notable change and development in both methods and machinery. The heaviest press built in the early days was a double-crank press weighing approximately 20,000 lb. The base, alone, of one of the company's recent presses weighs 350,000 lb.

In our illustration the small machine at left represents, in size, the average press of 1890. The large press at the right, in comparison with this smaller one, not only shows the development in size and capacity of machines, but represents a good comparison of plant growth also.





▲ ▲ ▲

**MORE THAN
A MILLION TONS OF
SHEETS A YEAR**

▼ ▼ ▼

THE American Rolling Mill Co. (Armco) was organized in 1900 to manufacture special iron and steel sheets. During the first year only a few thousand tons were produced. Today the company is the world's largest producer of special analysis iron and steel sheets and plates, having a capacity of more than 1,000,000 tons yearly.

We reproduce here one of a number of artistic sketches visualizing the spirit of modern steel making. It is from "The First Twenty Years," a historical sketch of Armco activities. Contrast this picture with the methods of the 1870's, as depicted in our frontispiece.

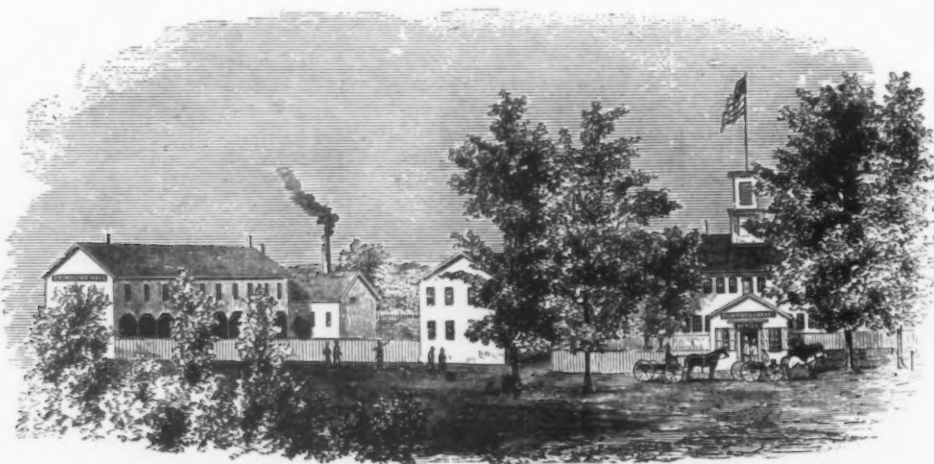
START OF THE WALLACE BARNES CO.

WALLACE BARNES was a shrewd Yankee who was always trading one thing for another. When he was young, he went out West with a carload of steel and traded it for a store. After a little while he traded this store for another one, and so on, until finally the steel was turned into cash. It was through a deal of this sort, which realized him \$1,600, that Wallace Barnes, in 1857, was able to buy out Platt & Company, and start in the manufacture of springs.

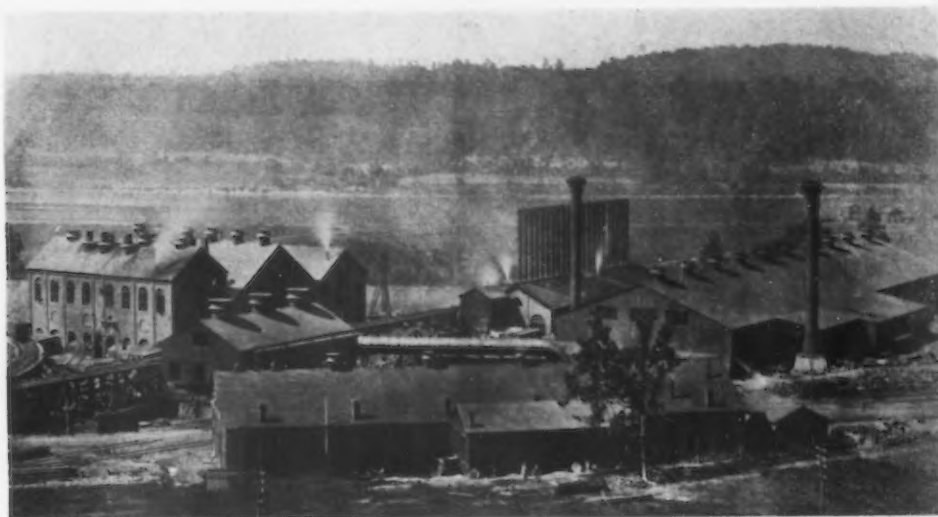
In 1858, Mr. Barnes joined forces with E. L. Dunbar, who in 1845 had started to manufacture main springs for the powerful clock industry, which then centered in Bristol, Conn. The hoopskirt fad was just starting, so the firm of Dunbar & Barnes prepared to capitalize it by making hoopskirt springs.

Later on, Mr. Barnes bought out the Dunbar interest and continued the manufacture of clock and other springs after the day of the hoopskirt had passed. The coming of various inventions and new types of products which require springs in their functioning has kept the Wallace Barnes Co. busy ever since. A few years ago the company's output had reached the total of 1,000,000 springs a day.

The illustration shows the old Dunbar & Barnes plant at Bristol.



▲ ▲ ▲
 WHEN
 STEEL RAILS
 WERE
 \$175 A TON
 ▼ ▼ ▼



ANDREW CARNEGIE, in 1872, viewed the European process of making rails and decided to have a Bessemer rail plant himself. With his associates and in the name of Carnegie, McCandless & Co., he secured 107 acres of land at Braddock, Pa., and in 1873 began construction of a Bessemer rail plant. It was named after J. Edgar Thomson, then president of the Pennsylvania Railroad.

The first rail was rolled here in September, 1875. The picture above shows the works at that time.

Wild demand after the Civil War had run the price of steel rails to \$175 a ton. Ending of the period of railroad "inflation" brought the price down rapidly.

In 1873 rails were \$120; by 1878 they had dropped to \$42. Here was a decided spur to high-production efficiency, and Capt. William R. Jones then general superintendent, made the most of it. He was a mechanical genius and made the business of the company pay by constant invention and improvement.

In 1889 Captain Jones was succeeded by Charles M. Schwab, who remained at the Edgar Thomson Works until labor troubles at Homestead resulted in his transfer to that plant. In 1898 pig machines, then a revolutionary innovation, were installed at this plant. In 1905, under the leadership of Charles E. Dinkey, the first electric mill in America was installed at the Edgar Thomson Works.

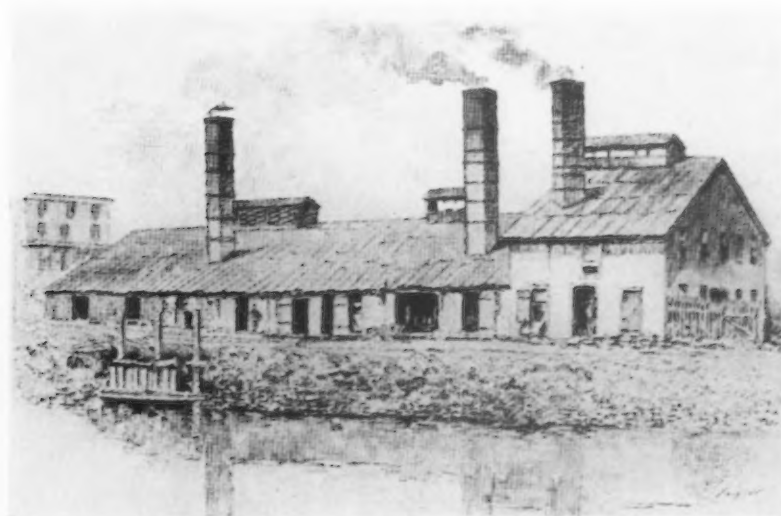
AMERICAN STEEL ROLLED IN 1826

THE Alan Wood Steel Co. Conshohocken, Pa., traces its beginnings back 138 years, when James Wood first established his smithy at Hickorytown, Pa. Alan Wood, a brother, with James, established the

Delaware Iron Works in 1826. Here iron, in the form of bars of American make or imported, were rolled into sheets.

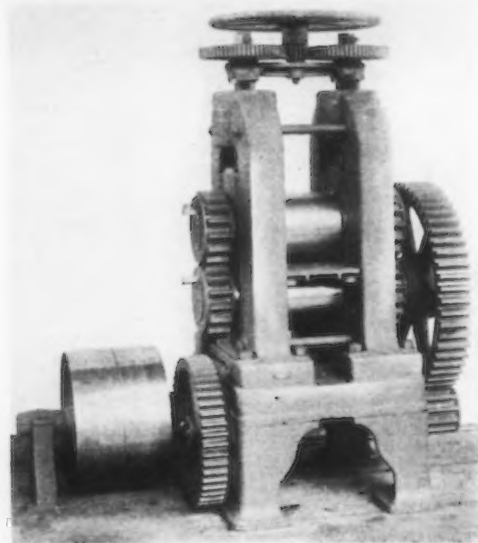
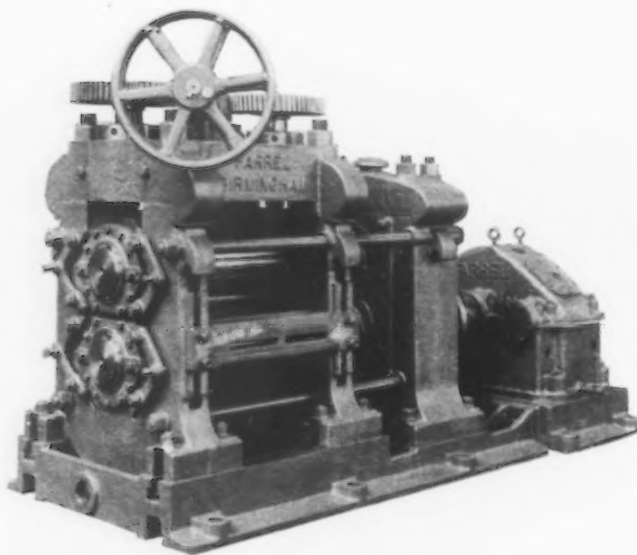
It is surprising to find, at this early date, that considerable steel was rolled at this mill, in the form of shovel or saw steel. Most of the steel consumed in the United States at that time was imported from England. In 1832 the business was moved to Conshohocken.

Our illustration shows the original mill at Conshohocken, powered by water-wheel.



ALMOST IN THE CENTURY-OLD CLASS

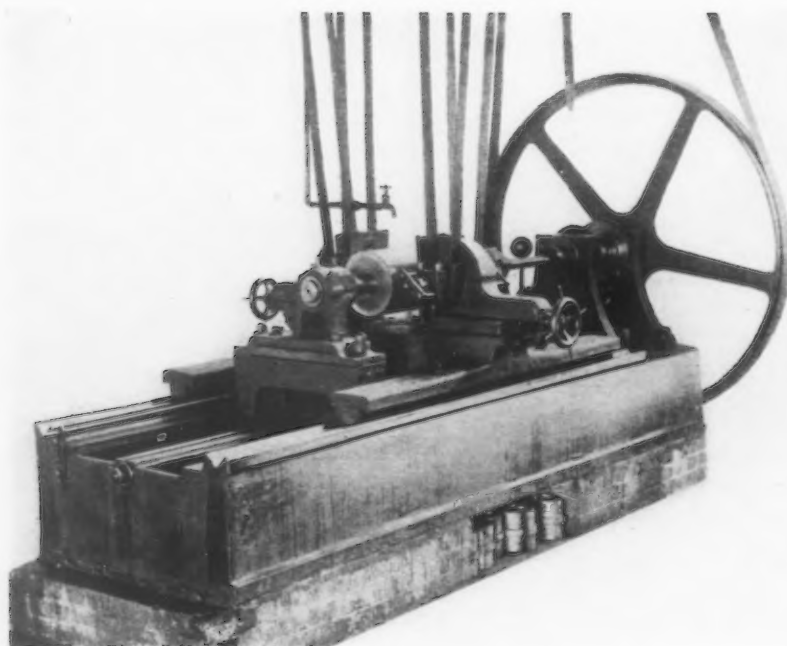
AND STILL GROWING



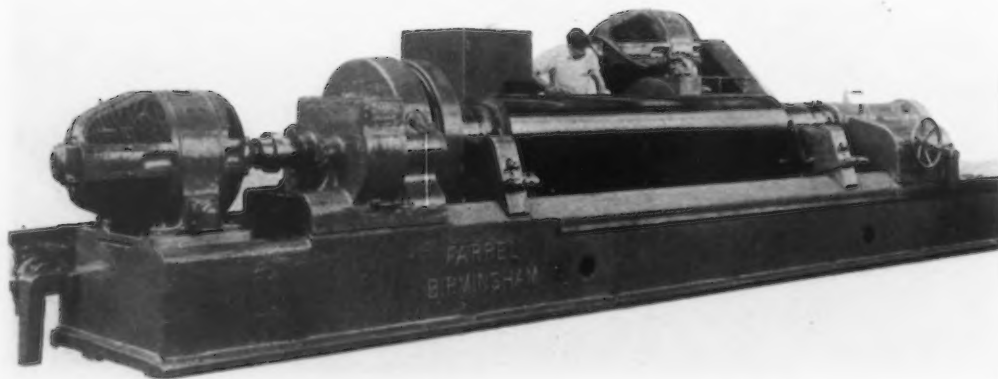
THROUGH its two predecessors, the Farrel Foundry & Machine Co. and the Birmingham Iron Foundry, the Farrel-Birmingham Co. goes back to 1848 and 1836. Interesting examples of the evolution of mill and grinder design are given by two sets of companion pictures.

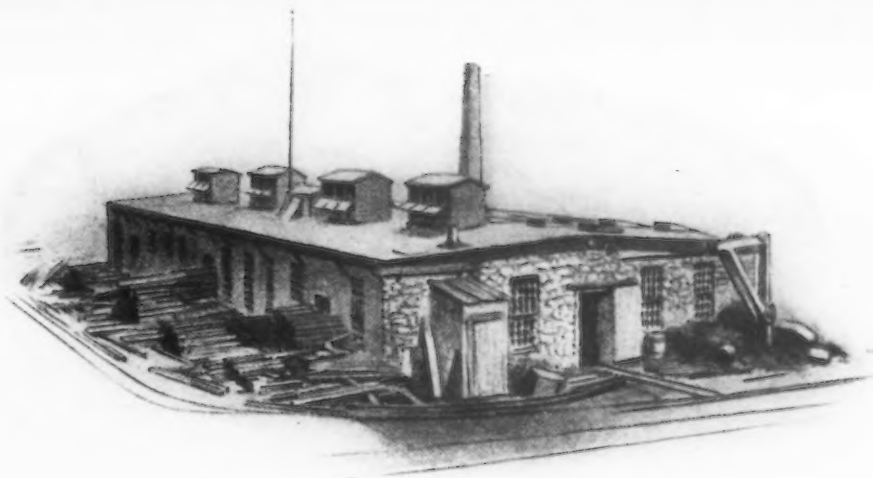
One of these shows the early type of small rolling mill, pulley-driven through cast gearing, as compared with a modern mill of corresponding capacity with direct motor drive, ball bearings and inclosed herringbone drive.

The second contrast is that between an early belt-driven roll grinder (with its liberal supply of replacement bearings in handy position) and a modern direct-driven heavy-duty roll grinder.



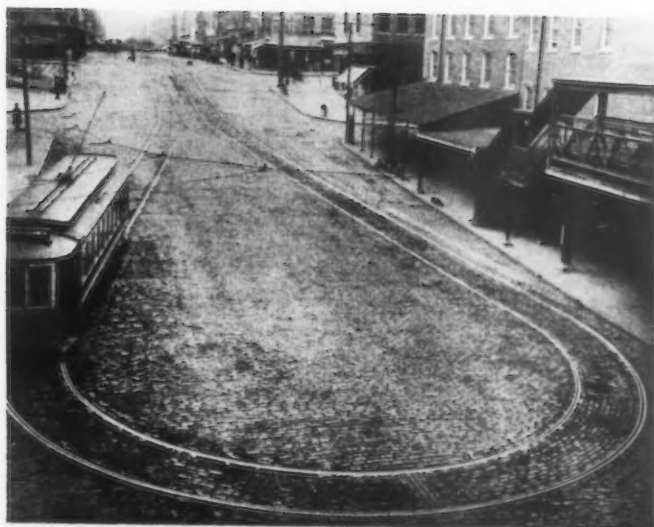
A STRIKING example of evolution of design is embodied in these grinders of then and now.





▲ ▲ ▲
**FIRST
 AMERICAN
 PRODUCTION
 OF
 MANGANESE
 STEEL**
 ▼ ▼ ▼

ABOUT 1859, William Wharton, Jr., & Co., Inc., Easton, Pa., was founded by William Wharton, Jr., who had then invented the Wharton railroad switch. Out of this grew a branch of the business devoted to the building of tracks for street railways.

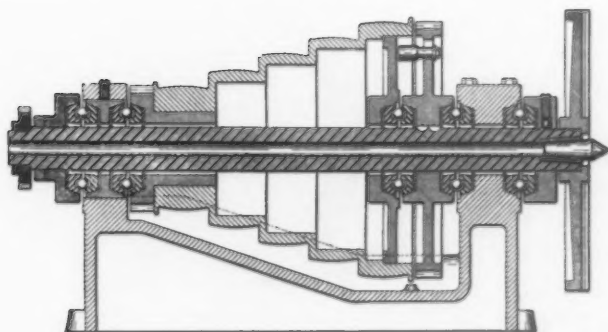


In 1894, this company began the application of manganese steel to rails, in curves of street railways. Later on, in 1900, this material was applied to the track work of steam railroads, also.

The illustrations show the original shop of William Wharton, Jr., in Philadelphia, in 1872, the Market Street loop, in Philadelphia, where manganese steel was first applied to rails in curves, and the rolls used for the first manganese steel rails.

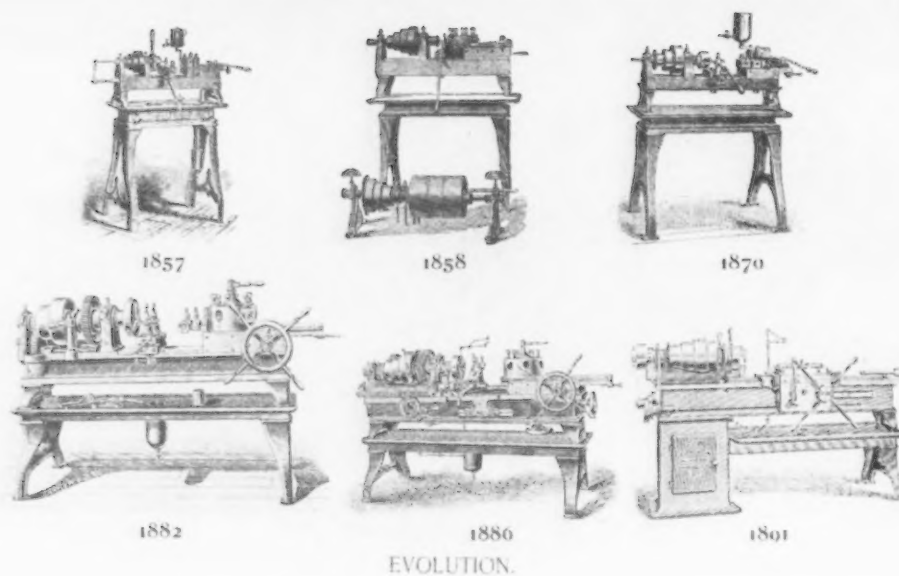


▲ ▲ ▲ **INDUSTRIAL APPLICATION OF BALL BEARINGS IN 1893** ▲ ▲ ▲

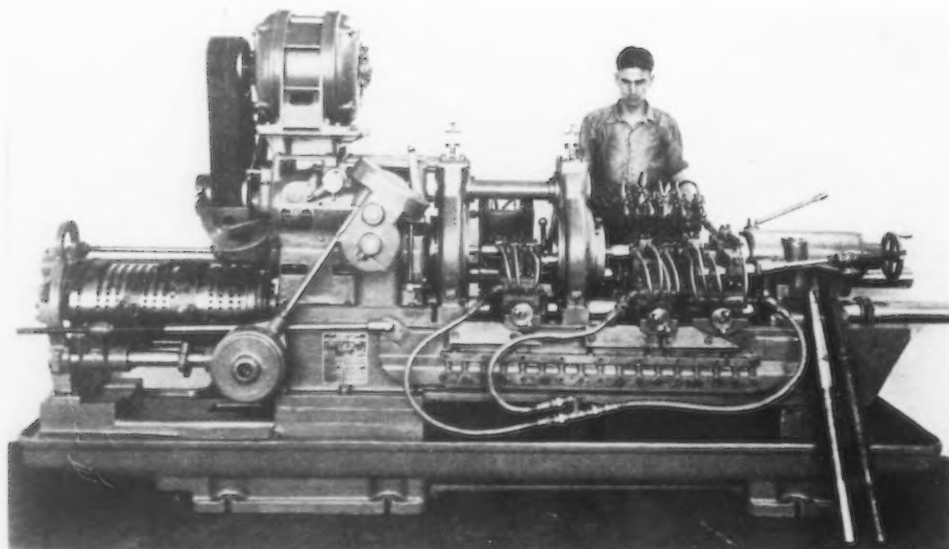


THAT the industrial application of ball bearings was contemplated and begun at an early date is evident from the catalog of the Auburn Ball Bearing Co., published in 1893. An illustration from this catalog is reproduced, showing the application of ball bearings to lathe heads. The text references to this and other illustrations, in the old catalog, could almost be taken as applying to today's installations.

EARLY EVOLUTION OF THE TURRET LATHE



EVOLUTION.



THE history of the Jones & Lamson Machine Co. dates back to 1835. Under a sequence of company names, beginning with Robbins & Lawrence, and culminating in the present company in 1879, the organization has been continuously doing business for 95 years.

During this period, or a good part of it at least, the Jones & Lamson company has been responsible for a large share in the evolution of the turret lathe, culminating in the present flat turret lathe.

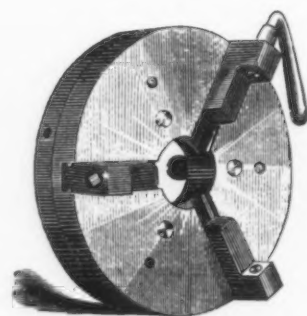
An interesting illustration of turret lathe evolution from 1857 to 1891, representing progressive designs of the company during that period, is reproduced. It is interesting to contrast these early machines with the modern Fay automatic, at left, manufactured by this company.

EXTRACT FROM FIRST CATALOG OF THE CUSHMAN CHUCK CO.

GENTS: In calling your attention to my new reduced price lists, please notice that I have not only reduced my prices 25 per cent, in most cases, but I have improved and added to the cost of my chucks over 25 per cent. I have always, heretofore, used cast iron for the scrolls in all sizes of lever chucks. I now use wrought iron for all up to 15 in., which more than doubles the actual wear of the chuck; and, as you see above, at a less price.

It is my aim to make as good a chuck as I possibly can, and not charge an exorbitant price, hoping thereby to bring myself into direct communication with consumers. I guarantee my chucks to be entirely satisfactory. Any party who buys a chuck of me, and it proves to be imperfect, can have it exchanged or money refunded.

Respectfully yours,
A. F. Cushman,
Hartford, Conn. 1873



FROM BLACKSMITH SHOP TO HUGE MANUFACTURING PLANT



IN 1857, with \$500 of borrowed capital, Elias C. Atkins, Sr., set up an anvil and a few other implements in a small shed near a planing mill in South East Street, Indianapolis. He called his shop the Sheffield Saw Works, a name still retained as a secondary title. All by hand he smithed and tempered round, drag and crosscut saws with such skill that his work soon gained a wide reputation. Instancing the early reverses, the little shop twice was destroyed by fire before removal of the enterprise to its present location.

The present corporation of E. C. Atkins & Co. was formed in 1885.

Every variety of saw that is practicable in the present day is produced by the Atkins factory in Indianapolis. The range extends from jewelers' saws, 4 in. long by $\frac{1}{8}$ in. wide, with teeth so fine they can scarcely be seen, to long band saws, 75 ft. long by 20 in. wide.

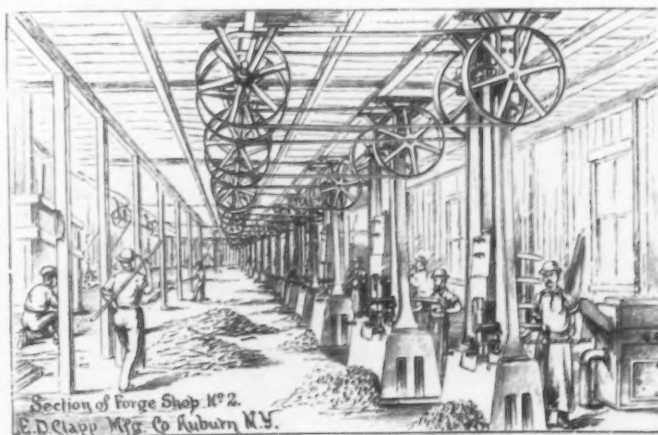


ONE OF THE OLDEST DROP FORGING PLANTS

IN 1864 Clapp & Fitch Co. was established at Ira, N. Y., as a drop forging plant. E. D. Clapp had been a manufacturer of farm wagons for ten years previous. Becoming tired of seeing wagon irons pounded out laboriously by hand, he determined to make them in a better and quicker way, by drop forging. In 1876 the company was incorporated under its present name, as the E. D. Clapp Mfg. Co. E. D. Clapp served as president until his death in 1889, and was in turn succeeded by his son D. E. Clapp and his grandson, E. D. Clapp, the present president of the company. Thus the business has been directed, since its inception, by three successive generations.

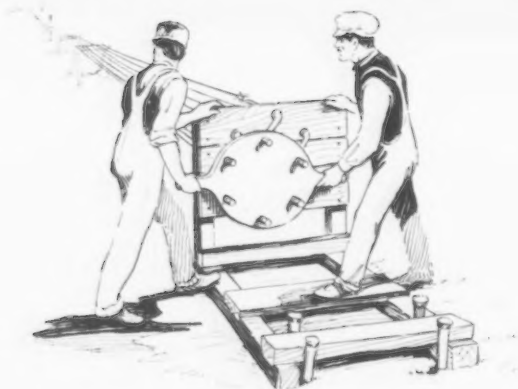
During the gay nineties, the company made millions of forgings for bicycles. Since that time, a large part of the business has

consisted of automobile forgings. Our illustration shows an interior of one of their drop forge shops in the "derby" hat days.





WHEN WIRE ROPE WAS MADE BY HAND

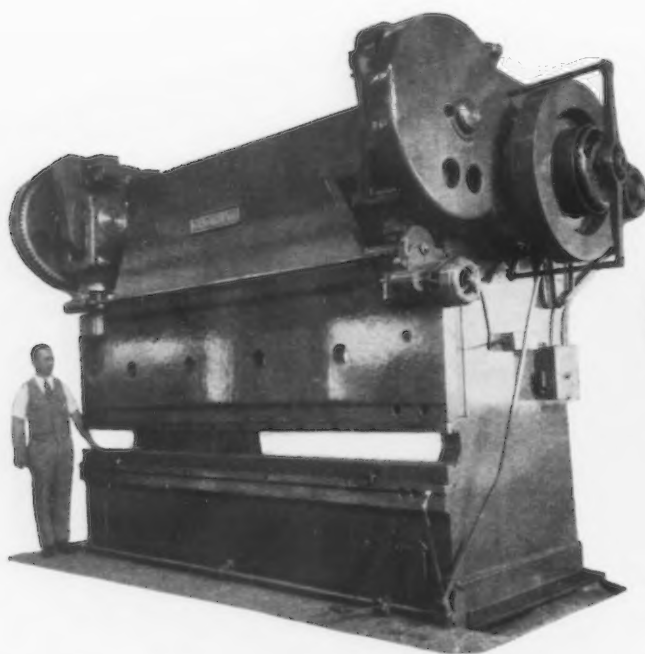


BACK in 1876, at the time Captain Eads was building his bridge at St. Louis, John J. Broderick and Joseph D. Bascom, the former a shipping clerk of 20 and the latter a bill clerk of 18 years, conceived the idea that wire-rope making promised an interesting future. With a minimum of capital, but plenty of "cheek," they established the Broderick & Bascom Rope Co. Out of this small beginning was destined to grow the huge plant shown as it appears today in St. Louis.

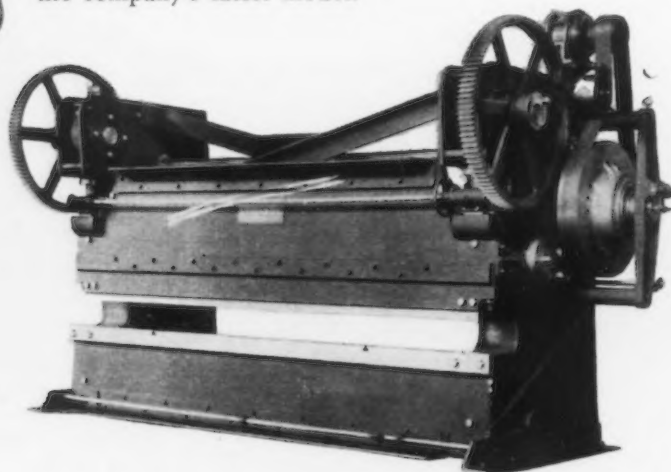
In the early days of wire-rope making, hand twisting was the method employed. At one end of the walk, two men worked at a stationary twisting platform, while the pair on the other end twisted the rope on a movable sled.



EVOLUTION OF ALL-STEEL PRESS BRAKE INFLUENCED BY ELECTRIC WELDING



ALL-STEEL frame construction of press equipment has undergone a remarkable growth aided by the development in electric welding. Here is shown the first all-steel press brake, made by the Cincinnati Shaper Co. in 1922, as contrasted with the company's latest model.





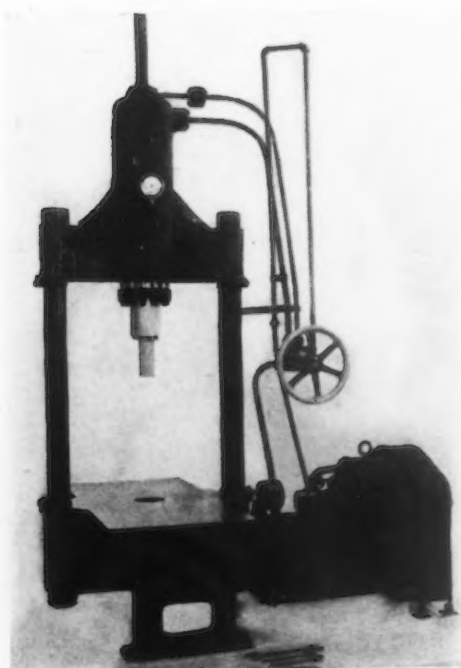
**SULLIVAN MACHINERY CO.
DATES BACK
TO 1851**

SOME 79 years ago the Sullivan Machinery Co., Chicago, had its beginnings in the little town of Claremont, N. H. The original concern, known as James P. Upham & Co., became in 1869 the Sullivan Machinery Co., with Mr. Upham as president.

Our illustrations show the old Claremont plant, in 1869, and an early model of a portable air compressor, of about 1903.

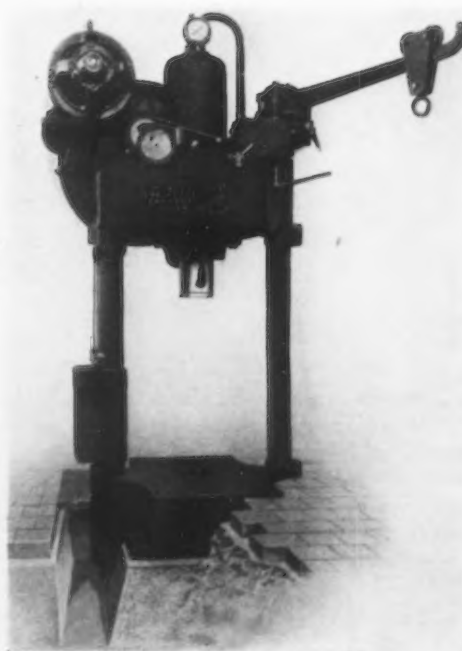


THIRTY-THREE YEARS OF ADVANCE AND REFINEMENT IN PRESS DESIGN EVOLUTION



THESE two illustrations show the evolution of design in a bushing press, one of the products of the Chambersburg Engineering Co. The first of these was built in 1897; the second is the present product.

In addition to the general refinement in design, obvious from a comparison of the two pictures, it is interesting to note that the motor of the present press is proportionately much smaller than that of the early one.



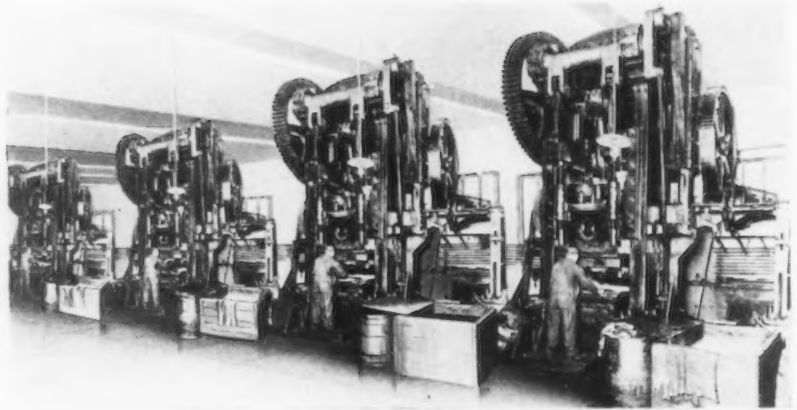


▲ ▲ ▲
**FIFTY-YEAR GROWTH
 OF PLANT AND
 PRODUCTION
 EQUIPMENT**
 ▼ ▼ ▼



AT the time that Geuder, Paeschke & Frey Co. occupied this little place of business in 1880, presses such as that illustrated above at the right were considered up-to-date equipment.

To get an idea of what 50 years has meant to the stamping industry, compare these beginnings with the present plant of the company, below, and the modern line of presses.

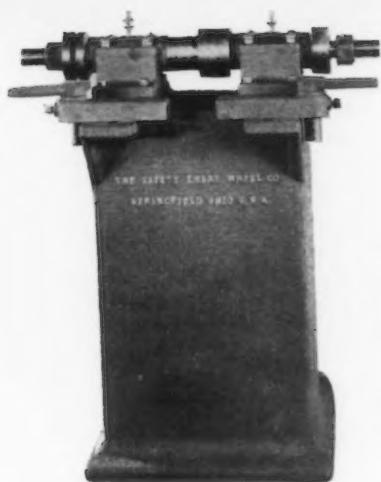


**HARDLY MORE THAN A LIFETIME AGO, BOLT MAKING WAS A JOB
 FOR THE BLACKSMITH**

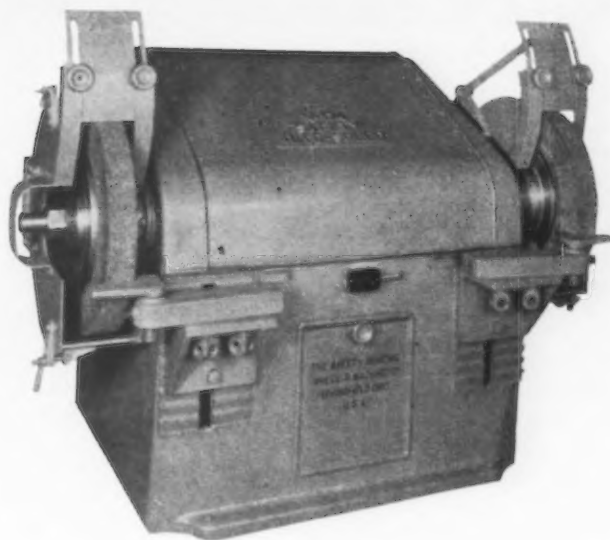
LAST year the Clark Brothers Bolt Co., Milldale, Conn., celebrated the seventy-fifth anniversary of its founding. However, the history of the individuals forming the first company, as associated with the bolt and nut business, extends back 17 years before this, to what is said to be the

first bolt shop established in America, shown below. This was built at Marion, Conn., in 1837, by Messrs. Rugg and Barnes. The latter gentleman later became connected with Clark Brothers and was instrumental in developing a number of the machines and processes used in bolt making.





▲ ▲ ▲
EVOLUTION
OF
FLOOR
GRINDERS
▼ ▼ ▼



HERE is an interesting example of the progress in design of floor grinders. It comes from the Safety Grinding Wheel & Machine Co., Springfield, Ohio. On the one hand is the machine which was the "last word" in the late '90's, and, contrasted with it, the corresponding machine of the present day. The former

has plain bearings and small spindle pulley, thus limiting the power; no hoods for protection, and but slightly adjustable rests.

The modern machine is motor driven, equipped with ball bearings, heavy hoods, adjustable rests and convenient electrical control.

▲ ▲ ▲ MATERIALS HANDLING IN FOUNDRY 25 YEARS AGO ▲ ▲ ▲

SOME 33 years ago the Troy Engine & Machine Co. started to make high-speed steam engines. The illustration of the foundry of 25 years ago is typical of other foundries of that period. Note the hand crane for handling molds and for pouring. "Materials

Handling," as we know it today, did not cut much figure in production in those days. Inset shows the high-speed engine made by the company at that period. Products as well as methods have changed a lot in the past quarter-century.



Punching the Clock Was an Old French Custom

MORE than 60 years ago, the watchman on his nightly rounds had begun punching the record of his tour of duty on time recording clocks, according to THE IRON AGE of Oct. 8, 1868. "A French journal describes a telltale apparatus in use in the vast establishment of Dolfus Meig & Company," says THE IRON AGE. "There are four night watchmen who have to make ten visits to 93 stations, in all 930 visits. On commencing his rounds, a card is delivered to each watchman which he carries about with him. At every station he has to visit is a frame of the same size, at which at a given time a stamp presents itself and impresses a mark on the pasteboard. The marks are so arranged that when the whole are printed they form one complete design. Any delay or omission on the part of the watchman leaves a blank space on the card, which tells the hour in which the man failed in his duty."

Rubber Paving Yesterday and Today

RUBBER paving of streets, now being considered as a possible means of reducing the noise of our modern civilization, was apparently greeted with humorous references in earlier times. In THE IRON AGE of May 6, 1875, there is the news that "India rubber sidewalks are coming into fashion out West. For small towns they are admirable—combining economy with durability. The first experiment was made in Danville, Iowa, where 300 yards were put down on one of the principal streets. All the boys in the place ran over it, but there was no noise. A leading merchant stopped in front of his house, then jumped on his heels. The elastic forces hidden in the rubber threw him over the gate to the roof of the piazza. But after a few trials he was able to alight on the steps with the graceful accuracy of a flying squirrel."

Today

In the course of a speech yesterday to shareholders in Harrisons & Crossfields, says the *Times* (London), the chairman, Mr. Eric Miller, made an interesting allusion to the subject of rubber roadways, which at this critical period for the planting industry will attract close attention. He pointed out that thanks to the pioneer efforts of

Rubber Roadways, Ltd., it had been proved that a rubber surfaced block could be properly anchored and could withstand the strain and stress of the heaviest and most concentrated traffic. Experience had also been gained as to the most suitable rubber compound to use, and the price at which a dependable rubber roadway could be laid had been reduced to £2 10s. (\$12.15) a square yard. Formerly, when costs had to be reckoned on the basis of £4 to £5 (\$19.45 to \$24.30) a square yard, the price factor was a definite bar to progress, but at £2 10s. this barrier is much reduced.

That Decorated Monstrosity—The Parlor Stove

"BRITISH taste and art, when applied to the decoration of stoves, seem to develop in extraordinary directions," caustically comments THE IRON AGE of March 23, 1876. "The British Trade Journal announces some new productions in this line as follows: 'The competition of rival producers of this class of goods is amusingly fierce, but, perhaps, the public benefits by the greater variety and elaborateness of the designs which are, as a consequence, brought before them. We have been shown two of the new registered designs of Messrs. Mulford Brothers, of Hoxton, who, it may be mentioned by the way, have just patented a process of satining paper for stove ornaments in an endless roll, this operation having been hitherto performed on sheets. The Peacock and the Queen of Summer are the names given to the designs referred to. Both are undeniably attractive, the former representing a peacock's plumage, and the latter a profusion of small wavy curls; the upper part of the ornament being embellished by the addition of an artistically arranged basket of flowers.'

"Stove manufacturers in this country," continues THE IRON AGE, "have indulged in some eccentricities in the matter of ornamentation for stoves, but we have never heard of their employing fancy wall papers for this purpose. We do not think paper peacocks and summer queens would answer very well, but probably it would be difficult to make an English stove so warm that paper would not answer for the superficial ornamentation. A stove ornamented with peacock's plumage, or a profusion of small wavy curls must be gorgeous to behold."

Radio Communication Tried in 1877

AS early as 1877, when the telegraph was in use, and the telephone known, attempts at wireless communication had not been without some success, according to THE IRON AGE of Dec. 13, 1877, which says:

"The scheme for telegraphing without wires, by means of aerial currents of electricity, has been revived by Professor Loomis. He has met with success in using kites for this purpose, a copper wire being substituted for the usual kite string. Signals were transmitted thus between kites ten miles apart. His new experiments were in the mountainous regions of West Virginia, between lofty peaks. Continuous aerial currents are found at these altitudes, which will serve the purposes of the telegraph, except when rarely interrupted by violent disturbances of the atmosphere. A scheme is now on foot to test the merits of aerial telegraphy in the Alps. The cheapness of the apparatus, as no wire is required between the stations, is greatly in favor of the method, and may counterbalance its liability to occasional interruption."

Coming of the Iron Railroad Car—1877

THE predecessor of steel cars on railroads was making rapid strides as early as 1877. In THE IRON AGE of Feb. 1, "we learn that a few weeks ago Mr. Theodore Allen, superintendent of the Western Iron Boatbuilding Company's works, in South St. Louis, formerly of New York City, undertook the construction of a railroad car exclusively of iron. The car is an ordinary platform or flat car, and was built more as an experiment than anything else. It is thirty feet long and nine feet wide, and built entirely of iron, with the exception of the flooring."

By June 7, there is the report that "the Empire line has recently had constructed at the shops of Murray, Dougal & Co., Milton, Pennsylvania, two box freight cars, the principal material of which is iron, one of them being the La Mothe style of construction, and the other what is known as the Kimball method."

Also on June 7 is the additional report that "fifty iron coal cars are being built at the Philadelphia and Reading railroad shops, to be used in the coal trade."

Railroad Inquiries for 50,000 Freight Cars Are in Prospect

PROSPECTS of heavier railroad buying, a slight gain in demand from the automotive industry, further moves toward stabilization of steel prices and indications that the scrap market may finally be scraping bottom are sources of encouragement in the iron and steel industry.

Inquiries for close to 50,000 freight cars, requiring 700,000 tons of steel, are expected following the completion of financial arrangements under which a leading banking house will sponsor the underwriting of equipment trusts at a low rate of interest for 80 per cent of the purchase price of the rolling stock and car builders will carry the remaining 20 per cent on their books for repayment in small instalments. Meanwhile railroads are adding to their repair shop forces and are coming into the market for their shop requirements in steel. The Pennsylvania opened bids Nov. 17 on 42,000 tons of plates, shapes and bars for delivery through the first half of 1931. Pending rail business has been augmented by inquiries for 80,000 tons from the Louisville & Nashville and 10,000 tons from the Wabash.

In the automobile industry the launching of production on new models has resulted in a moderate gain in steel orders, particularly in the Cleveland district, where steel ingot output has been raised in two weeks from 20 per cent to 44 per cent of capacity. The trend in the motor car trade is not uniform, with some manufacturers further reducing production and others, notably the Chevrolet company, expanding output. The Chevrolet program for November-December calls for a production of 90,000 to 100,000 cars. A large part of this output will be needed to supply dealers and a tentative schedule of 75,000 cars for January is subject to change in conformity with the public's response to model changes. Some inquiry for automotive steel for first quarter delivery has appeared and December is expected to bring out heavier specifications for January shipment.

With seasonal forces at work which ordinarily cause a tapering of steel output as the year-end approaches, the gain in prospective demand is interpreted as a promise of improvement in January rather than in the immediate future. The proposed railroad car building program could hardly affect steel mill operations before next year and to a large extent the same thing can be said of expected betterment in automotive requirements. Nevertheless the change of sentiment in the steel trade has revived the hope that ingot output is close to bottom and that further declines will be small at the most. Whether significant

▲ ▲ ▲
AUTOMOTIVE Demand Also Improving—Price Stabilization Movement Gains Headway—Scrap Shows Signs of Bumping Bottom.
▼ ▼ ▼

of an impending change in trend or not, the production of the Steel Corporation has advanced slightly, partly offsetting additional losses by other companies. Raw steel output for the country at large, at 43 per cent, compares with a rate of 44 per cent a week ago.

Prospects of better business, mounting costs, and a realization that a considerable volume of potential trade has been withheld from the market because of chronic price irregularity are among the factors that have given impetus to the stabilization move inaugurated last week by the Carnegie Steel Co. Independents have followed the lead of that interest in announcing minimum quotations on plates, shapes and bars, and it is now thought likely that a similar stand will be taken on strips and sheets.

The need for such action is indicated by fresh reductions of \$1 a ton on hot-rolled strip and \$2 a ton on fender stock, and the appearance of more frequent concessions on cold-rolled strip. Among the wire products, nails have shown further weakness, now selling at \$1.90 a keg to the jobbing trade.

Scrap markets are lethargic, with weakness still the dominant characteristic, although not so universal as recently. Heavy melting grade is off 25c. a ton at Pittsburgh and Detroit, but has advanced 50c. at Philadelphia. THE IRON AGE steel scrap composite, at \$11.67 a gross ton, is 11c. higher than a week ago.

Eastern Pennsylvania foundry pig iron, under pressure of competition from the Alabama product, has declined 50c. a ton to \$17.50, furnace. Price readjustments among some of the minor primary materials include reductions of \$1 a ton on spiegeleisen and \$1.50 to \$4 a ton on Bessemer ferrosilicon.

The downward trend of line pipe specifications has been checked. Mills have benefited both by fresh releases against old pipe orders and the booking of a new contract for 25,000 tons by the Milwaukee fabricator. Structural steel awards for the week, at 28,000 tons, include 15,000 tons of tank work placed by the Continental Oil Co. The large amount of pending work was augmented by new inquiries for 45,000 tons.

Copper, after advancing on Nov. 14 to 12c. a lb., Connecticut Valley, has broken to 11c., indicating that the rise in prices was too rapid.

THE IRON AGE composite price for pig iron has declined from \$16.29 to \$16.13 a gross ton. The finished steel composite is unchanged at 2.135c. a lb.

DR. HANEY'S PAGE { Business as the } IS 1571 OF THIS SECTION
{ Economist Sees It }

PITTSBURGH

Price Stabilization Move in Sheets and Strip Steel Expected

PITTSBURGH, Nov. 18.—Favorable business developments outside of the steel industry and reports of further efforts toward price stabilization within it have given the market a somewhat better tone in the last week. Generally speaking, these factors have helped to draw attention away from the immediate picture, which has been further depressed by reduced steel-making operations in Pittsburgh and nearby districts, and a continued decline in current specifications.

Independent steel companies in this district have unanimously followed the lead of the leading interest in attempting to stabilize the price of bars, plates and shapes at 1.60c., Pittsburgh. While lower quotations outstanding, particularly on plates and shapes, have not been wholly withdrawn, the higher price is now being quoted generally on new business, and, if efforts toward stability are successful, a further increase in asking prices would not be unexpected.

Leading makers of sheets and strip steel are also reported to be considering an upward revision. An announcement of first quarter quotations, which is expected in the next few days, will undoubtedly attempt to bring stability to the market by elimination of present minimum quotations. The mere prospect of higher sheet quotations has stimulated specifications against contracts recently placed at low prices, which may be canceled during December if not specified against, particularly if the market turns upward. Steel makers believe that higher asking prices would certainly stimulate first quarter contracting, although some of this business would have to be "bought" in the usual way.

The raw material markets have developed a little life, and some of the larger steel companies are reported to have placed heavy orders for raw materials for investment purposes. This has been particularly true in the case of non-ferrous metals, which were considerably influenced by the sharp upward turn in copper quotations last week. Scrap and pig iron, on the other hand, are as dull as recently, and the scrap market has tended to grow weaker because of lack of consumer interest.

Steel ingot operations in the Pittsburgh district this week are not above 45 per cent of capacity, and have dropped more than 10 points since the first of the month. The rate of the independent companies is particularly low, ranging from 35 to 40 per cent of capacity. In the Valleys, production is considerably under that point, although fluctuations from week to week

Further efforts toward price stabilization expected in announcement of minimum quotations on sheets and strip steel this week.

* * *

Makers of bars, shapes and plates may also name a higher price level for the first quarter.

* * *

Meanwhile, specifications and mill operations are declining. Pittsburgh ingot rate not above 45 per cent, with lower rate in the Valleys.

* * *

Scrap market weakness continues, with a drop of 25c. a ton in average price of heavy melting steel.

make it difficult to determine a reliable figure.

The rate of finishing mill activity is about the same as that in the open-hearth departments, although output of some products is even lower. Seamless pipe mills are still maintaining a fair rate of operation, and structural units are engaged at a considerably better rate than the remainder of the industry. On the other hand, sheet and strip mills are not averaging much better than 40 per cent of theoretical full capacity, while output of bars is even less encouraging. Pittsburgh mills have benefited by the placing of comparatively heavy tonnages of railroad car building steel in the last few days, but have not yet received the rail orders which are expected to contribute materially to unfilled tonnage within the next month. Likewise, buyers of tin plate are slow in placing their contracts, in spite of the fact that such business is usually entered soon after the opening of books at about this time of the year. Some first quarter inquiry for sheets and strip has appeared, but it is difficult to ascertain whether such prospective business is genuine or whether buyers are merely anxious to take advantage of the current low quotations over a longer period than they have been extended thus far.

Pig Iron

Scarcely any of the interest in first quarter requirements reported from other districts is noticed in Pittsburgh and the Valleys, where buyers of iron are content to order from week to week at current quotations. Under the circumstances, sellers are not disposed to press for business, as current quotations are none too strong and requests for an inside price would

undoubtedly follow pronounced solicitation. Shipments of iron during November have shown no gain over those of the preceding month, and, if the declining requirements of the smaller steel companies which use basic are included, the average falls under October. Among the principal foundry groups in this district only radiators show any signs of improvement, although steel foundries serving the railroad equipment makers expect some increase in their needs before the end of the year. Prices are being given no test except on small lots, and continue to be quoted nominally at \$17, Valley, for foundry and basic, and \$17.50 for malleable and Bessemer. The Pittsburgh furnace is quoting prices 50c. higher.

Prices per gross ton, f.o.b. Valley furnace:
Basic\$17.00
Bessemer 17.50
Gray forge 16.50
No. 2 foundry 17.00
No. 3 foundry 16.50
Malleable 17.50
Low phos., copper free....\$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:
Basic\$17.50
No. 2 foundry 17.50
No. 3 foundry 17.00
Malleable 18.00
Bessemer 18.00

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

Semi-Finished Steel

The market continues quiet, with no change in the nominal quotation of \$31, Pittsburgh, on billets, slabs and sheet bars, and \$36 on forging billets. Wire rods are also quotable at \$36, Pittsburgh or Cleveland, with shipments light.

Bars, Plates and Shapes

Independent producers of heavy hot-rolled products have generally adopted the 1.60c., Pittsburgh, minimum on bars, plates and shapes, which was announced last week by the leading interest. Cases have been reported in which quotations under the 1.60c. figure on plates and shapes have been withdrawn, although mills have naturally been unable to take back protection figures offered to structural fabricators who are submitting bids on competitive jobs. The general result of the price stabilizing movement is favorable, although consumers have not found it necessary to rush to cover on their normal requirements. On bars the 1.60c. price is now very well established, and mills have very little tonnage on their books taken at lower figures. Talk of an advance to cover first quarter contracts is heard, but a further move in this direction would hardly be reflected substantially in first quarter billing quotations.

Orders during the last week showed

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Nov. 18, 1930	Nov. 11, 1930	Oct. 21, 1930	Nov. 19, 1929
No. 2 fdy., Philadelphia.....	\$18.26	\$18.76	\$18.76	\$21.26
No. 2, Valley furnace.....	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'ti.....	14.69	15.19	15.19	17.69
No. 2, Birmingham.....	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago.....	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa.....	17.75	17.75	17.75	19.75
Basic, Valley furnace.....	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh..	19.26	19.26	19.26	20.76
Malleable, Chicago.....	17.50	17.50	17.50	20.00
Malleable, Valley.....	17.50	17.50	17.50	19.00
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace....	94.00	94.00	94.00	105.00

Rails, Billets, etc., Per Gross Ton:	Nov. 18, 1930	Nov. 11, 1930	Oct. 21, 1930	Nov. 19, 1929
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh..	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh.....	31.00	31.00	31.00	35.00
Slabs, Pittsburgh.....	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh....	36.00	36.00	36.00	40.00
Wire rods, Pittsburgh.....	36.00	36.00	36.00	40.00
Skelp, grvd. steel, P'gh, lb...	1.60	1.60	1.60	1.85

Finished Steel, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.60	1.60	1.60	1.90
Bars, Chicago.....	1.70	1.70	1.70	2.00
Bars, Cleveland.....	1.65	1.65	1.65	1.90
Bars, New York.....	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh.....	1.60	1.60	1.60	1.90
Tank plates, Chicago.....	1.70	1.70	1.70	2.00
Tank plates, New York.....	1.88	1.88	1.88	2.17 1/2
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.90
Structural shapes, Chicago...	1.70	1.70	1.70	2.00
Structural shapes, New York...	1.85 1/2	1.85 1/2	1.85 1/2	2.09 1/2
Cold-finished bars, Pittsburgh	2.00	2.00	2.10	2.30
Hot-rolled strips, Pittsburgh..	1.55	1.60	1.60	1.90
Cold-rolled strips, Pittsburgh.	2.35	2.35	2.35	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel, Per Lb. to Large Buyers:	Nov. 18, 1930	Nov. 11, 1930	Oct. 21, 1930	Nov. 19, 1929
Sheets, black, No. 24, P'gh...	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago	2.45	2.45	2.55	2.85
Sheets, galv., No. 24, P'gh...	2.95	2.95	3.00	3.40
Sheets, galv., No. 24, Chicago	3.10	3.10	3.10	3.50
Sheets, blue, No. 13, P'gh...	2.05	2.05	2.05	2.25
Sheets, blue, No. 13, Chicago	2.15	2.15	2.25	2.45
Wire nails, Pittsburgh.....	1.90	1.95	2.00	2.40
Wire nails, Chicago dist. mill.	2.00	2.00	2.05	2.45
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.40
Plain wire, Chicago dist. mill.	2.35	2.35	2.35	2.45
Barbed wire, galv., P'gh.....	2.60	2.60	2.70	3.05
Barbed wire, galv., Chicago	2.75	2.75	2.85	3.10
Tin plate, 100 lb. box, P'gh...	\$5.00	\$5.00	\$5.00	\$5.35

Old Material, Per Gross Ton:	Nov. 18, 1930	Nov. 11, 1930	Oct. 21, 1930	Nov. 19, 1929
Heavy melting steel, P'gh....	\$13.00	\$13.25	\$14.50	\$16.00
Heavy melting steel, Phila....	12.00	11.50	12.50	15.00
Heavy melting steel, Ch'go...	10.00	10.00	11.00	13.00
Carwheels, Chicago.....	11.75	12.50	13.00	14.00
Carwheels, Philadelphia.....	14.00	14.50	15.00	15.50
No. 1 cast, Pittsburgh.....	12.50	12.50	13.25	15.00
No. 1 cast, Philadelphia.....	12.00	12.00	13.00	16.00
No. 1 cast, Ch'go (net ton)...	9.50	9.50	10.50	13.50
No. 1 RR. wrot., Phila.....	13.50	14.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)...	8.50	8.50	9.25	12.25

Coke, Connellsville, Per Net Ton at Oven:	Nov. 18, 1930	Nov. 11, 1930	Oct. 21, 1930	Nov. 19, 1929
Furnace coke, prompt.....	\$2.50	\$2.50	\$2.60	\$2.65
Foundry coke, prompt.....	3.50	3.50	3.50	3.75

Metals, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	12.12 1/2	9.62 1/2	10.12 1/2	18.12 1/2
Electrolytic copper, refinery..	10.75	9.25	9.75	17.75
Tin (Strait), New York.....	25.75	25.12 1/2	27.12 1/2	39.75
Zinc, East St. Louis.....	4.32 1/2	4.37 1/2	4.00	6.25
Zinc, New York.....	4.67 1/2	4.72 1/2	4.35	6.60
Lead, St. Louis.....	4.95	4.95	4.95	6.10
Lead, New York.....	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y....	7.12 1/2	7.10	7.37 1/2	8.62 1/2

little change in volume, although the railroads have added considerable tonnage to mill books since the first of the month. The Pennsylvania has placed substantial quantities of plates and shapes with Pittsburgh mills in addition to the requirements for the cars it will build in its own shops, and new equipment purchases may be given further incentive by arrangements now in progress at Washington by which private banking interests would lend money to the carriers on their equipment purchase certificates at a minimum rate of interest. Structural inquiry is still in fair volume, although awards have been light in the last few days. A few comparatively small projects are pending in the Pittsburgh district. New York States takes bids on Nov. 18 on 1000 tons for highway bridges. Smaller fabricating shops are running at about 25 per cent of capacity, while the larger interests are maintaining 50 per cent or better.

Railroad Equipment

Interest in the market on railroad materials is confined principally to new equipment and purchases of rails and track accessories have not yet been made in large volume. However,

the rail inquiries of the larger roads are expected to come out before the end of the month and track accessories will naturally follow. Makers of accessories are expected to announce 1931 prices in the next few days. The local rail mill is maintaining a light operation, with steady improvement in sight over the remainder of the year.

Cold-Finished Steel Bars

New business is limited and specifications show no improvement. Local mills are running at about 30 per cent of capacity. The market is quotable at 2c. to 2.10c., Pittsburgh, and is expected to reflect the stability of the hot-rolled bar price. The present minimum on cold-finished stock allows an \$8 spread over hot bars, which is the same differential prevailing last year when cold bars were selling at 2.30c.

Tubular Goods

Line pipe prospects for next year have been considered in the last week, and the Milwaukee fabricator has reported the placing of 145 miles of feeder pipe for a project in the South. A line from Louisiana to Detroit is mentioned as a possibility for placing early in 1931, but is still in an indefinite stage. Pipe mill operations in

Pittsburgh and Youngstown show little change and demand is generally quiet. Boiler tubes show some activity.

Wire Products

Specifications this month are falling behind those of last month and are running close to the average for the corresponding month last year. Jobbers are notably listless in placing business, but shipments to the manufacturing trade reflect the generally low state of industrial activity. Nail prices are weaker as jobbers are able to place business with no difficulty at \$1.90, Pittsburgh. The price to the trade ranges from \$1.95 to \$2 per 100-lb. keg. Manufacturers' wire is officially unchanged at 2.30c., Pittsburgh.

Bolts, Nuts and Rivets

Business this month shows slight declines from October levels. Leading manufacturers are operating at 35 to 40 per cent of capacity. Weakness in the resale market is not reflected in makers' quotations.

Sheets

Last week's move to stabilize prices on the heavy hot-rolled products has

THE IRON AGE COMPOSITE PRICES

	Finished Steel		Pig Iron		Steel Scrap	
	2.135c. a Lb.		\$16.13 a Gross Ton		\$11.67 a Gross Ton	
Nov. 18, 1930	2.135c.		16.29		11.58	
One week ago	2.135c.		16.29		12.67	
One month ago	2.135c.		16.29		14.67	
One year ago	2.362c.		18.38			
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.		Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.		Based on heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.	
	High	Low	High	Low	High	Low
1930.....	2.362c., Jan. 7;	2.135c., Oct. 14	\$18.21, Jan. 7;	\$16.13, Nov. 18	\$15.00, Feb. 18;	\$11.58, Nov. 11
1929.....	2.412c., April 2;	2.362c., Oct. 29	18.71, May 14;	18.21, Dec. 17	17.58, Jan. 29;	14.08, Dec. 3
1928.....	2.391c., Dec. 11;	2.314c., Jan. 3	18.59, Nov. 27;	17.04, July 24	16.50, Dec. 31;	13.08, July 2
1927.....	2.453c., Jan. 4;	2.293c., Oct. 25	19.71, Jan. 4;	17.54, Nov. 1	15.25, Jan. 11;	13.08, Nov. 22
1926.....	2.453c., Jan. 5;	2.403c., May 18	21.54, Jan. 5;	19.46, July 13	17.25, Jan. 5;	14.00, June 1
1925.....	2.560c., Jan. 6;	2.396c., Aug. 18	22.50, Jan. 13;	18.96, July 7	20.83, Jan. 13;	15.08, May 5

led to considerable talk of a similar program on the part of sheet makers, but no announcement has been made. Mills are not booked ahead further than Jan. 1, and, as some consumers have expressed desire to get protection beyond the first of the year at present low prices, a price stand for the first quarter cannot be delayed long. While an advance of large proportions is not expected, an attempt at stabilization at \$2 a ton over present minimum quotations would not be unexpected. Prices continue weak, but have not fallen under recent minimum figures. Any change which may have occurred has been in the form of wider recognition of lower quotations on small tonnages. Specifications continue light and the expected improvement in the automobile industry because of model changes has not developed to any marked extent. The sheet industry is operating at 40 to 45 per cent of capacity.

Tin Plate

Not much 1931 contracting is reported, as consumers seem anxious to reduce inventories to a minimum before placing advance orders. Mills in this district are running at 40 to 45 per cent of capacity.

Strip Steel

Strip users have begun to show interest in their first quarter requirements, but manufacturers have not yet opened their books for that period. A price advance is expected in some quarters, particularly on hot-rolled material, which has weakened since the first of the month and is now quoted at 1.55c. to 1.60c., Pittsburgh, on the wider sizes and 1.65c. to 1.70c. on the narrow. Cold-rolled strip at 2.35c., Pittsburgh, is subject to concessions of as much as \$2 a ton in some cases. Specifications are light and mill operations range from 25 per cent of capacity on cold-rolled to 40 per cent on hot.

Coke

Shipments of foundry coke have been slightly heavier this month than in October, but the furnace grade is sluggish in the face of light blast furnace operations. Production in the Connellsville region is at a very low

rate and by-product coke is proving highly competitive even on small orders. The price is fairly well maintained at \$2.50, Connellsville. Domestic coke has been unusually dull because of the unseasonably warm weather in the last week or two and the same conditions have affected the coal market. Industrial and railroad consumption show no improvement.

Old Material

The influence of distress scrap in the present market continues to depress quotations and, based upon actual sales, No. 1 heavy melting steel must be quoted at a lower range than would be justified in the case of any substantial mill buying. Sales of both heavy melting steel and hydraulic compressed sheets were made during the week at as low as \$12.50, but involved no significant tonnage. On the other hand, another consumer paid \$13.50 for a small lot of high-grade scrap. Dealers are not anxious to buy, but usually pay their regular sources

of supply from \$12.50 to \$13 for occasional offerings. Under the circumstances, heavy melting steel is quotable this week at \$12.50 to \$13.50, with an average price of \$13, representing a decline of 25c. from a week ago. Compressed sheets are slightly lower and sales of blast furnace turnings at \$8 have brought about a decline of 50c. in the market on this material. No changes have occurred in the other grades, which are nominally quoted at the same levels as last week. While the present market offers attractive investment possibilities, mills are not disposed to place orders. Yard stocks of both consumers and dealers are rather large.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:

No. 1 heavy melting steel..	\$12.50 to \$13.50
No. 2 heavy melting steel..	10.50 to 11.00
Scrap rails	12.50 to 13.00
Compressed sheet steel....	12.50 to 13.00
Bundled sheets, sides and ends	10.50 to 11.00
Cast iron carwheels.....	13.50 to 14.00
Sheet bar crops, ordinary..	13.50 to 14.00
Heavy breakable cast.....	9.00 to 9.50
No. 2 railroad wrought....	13.00 to 13.50
Hvy. steel axle turnings...	11.00 to 11.50
Machine shop turnings....	6.00 to 6.50

Acid Open-Hearth Grades:

Railr. knuckles and couplers	15.50 to 16.00
Railr. coil and leaf springs	15.50 to 16.00
Rolled steel wheels.....	15.50 to 16.00
Low phos. billet and bloom ends	17.00 to 17.50
Low phos. mill plates....	15.00 to 15.50
Low phos. light grades....	15.00 to 15.50
Low phos. sheet bar crops	16.00 to 16.50
Heavy steel axle turnings.	11.00 to 11.50

Electric Furnace Grades:

Low phos. punchings....	15.00 to 15.50
Heavy steel axle turnings.	11.00 to 11.50

Blast Furnace Grades:

Short shoveling steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings.....	7.50 to 8.00

Rolling Mill Grades:

Steel car axles.....	18.00 to 18.50
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Cupola Grades:

No. 1 cast.....	12.00 to 13.00
Rails 3 ft. and under....	14.00 to 14.50

Warehouse Prices, f.o.b. Pittsburgh

*Base per Lb.

Plates	2.85c.
Structural shapes.....	2.85c.
Soft steel bars and small shapes..	2.75c.
Reinforcing steel bars.....	2.75c.
Cold finished and screw stock—	
Rounds and hexagons.....	3.35c.
Squares and flats.....	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.15c. to 3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.75c. to 3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates.....	2.75c.
Blue annealed sheets (No. 13)....	2.65c.
Galv. corrug. sheets (No. 28), per square	4.25c.
Spikes, large	2.65c.
Small	3.05c. to 4.50c.
Boat	3.15c.
Track bolts, all sizes, per 100 count, 60 and 10 per cent off list	
Machine bolts, 100 count, 60 and 10 per cent off list	
Carriage bolts, 100 count, 60 and 10 per cent off list	
Nuts, all styles, 100 count, 60 and 10 per cent off list	
Large rivets, base per 100 lb.	\$3.30
Wire, black, soft ann'd, base per 100 lb.	\$2.40 to 2.50
Wire, galv. soft, base per 100 lb.	2.85 to 2.95
Common wire nails, per keg	2.25
Cement coated nails, per keg	2.45

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

"Useful Data Concerning Brass and Bronze Castings" is the title of a small booklet published by William H. Barr, Inc., Buffalo, N. Y. It is the second edition revised and is beautifully illustrated. It gives the composition, properties and other data of several alloys made by this company and each alloy is illustrated with a photomicrograph of its structure.

CHICAGO

New Pipe Line and Oil Tank Work Aid Western Plate Mills

CHICAGO, Nov. 18.—Probably the most encouraging news in the local iron and steel trade comes from the plate market. For a number of weeks specifications for steel for pipe manufacture have been at a very low point, but in recent days releases against old pipe orders plus a new order for 25,000 tons of large diameter pipe have raised activity at plate mills, and in one instance a producer has a satisfactory plate schedule for the remainder of the year. Pipe manufacture at Milwaukee has been speeded up, and output at the new level seems assured to about Jan. 1. An oil company's orders for tanks call for 15,000 tons of plates.

On the other hand, rail purchases are dragging and releases are in such volume that local rail mills cannot sustain output above 25 to 30 per cent of capacity.

New sales of finished steel are erratic, and the gain in volume reported last week has not been sustained. Specifications, influenced largely by plates, are the best in 10 weeks. However, the margin of gain is small as indicated by ingot production, which stands at a shade under 45 per cent of capacity.

For the first time in many weeks, steel mills have benefited by specifications from car builders. This situation promises to improve when orders are placed by the Santa Fe, which may add to its present inquiry. Railroad shops continue to expand operations. The Union Tank Car Co. is said to be placing orders for six months' supplies of steel for car repairs.

Plates

The Chicago plate market has reversed its form from a week ago. The A. O. Smith Corp. has taken a contract for 145 miles of gas line and has placed orders at local mills for 25,000 tons of plates. Some shipments are now under way. Other releases for line pipe have also helped to improve the picture. One plate mill unit is now well scheduled to the end of the year. Other sources are also contributing to the better tone of this market.

The Great Lakes Pipe Line Co. has placed a contract for tanks that will require 15,000 tons of steel. This order was given out at Tulsa, Okla., but the tanks are to be erected at pumping stations along the company's pipe lines. Other orders for tank steel were scattered and in small aggregate tonnage, but it is reported that inquiries are in the making, and the prospect is that tank builders will remain busy for some time to come. Specifications from car builders are worthy of note, principally because of the extreme scarcity of releases by

While ingot output is slightly lower, moderate improvement is in evidence in some lines.

* * *

Pipe line order placed with A. O. Smith Corp., Milwaukee, calls for 25,000 tons of plates, now being rolled by Chicago mills.

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Western plate market also aided by oil tank work, including 15,000 tons for an oil company.

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For first time in many weeks mills are benefiting from railroad car orders.

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Scrap market continues weak. Mill buys 10,000 tons of heavy melting steel at \$10.50.

this industry in the past month or so. Shipping instructions are now being sent to mills for material for the Chicago Great Western cars and also for cars for the Pullman Co.

Pig Iron

Prices for Northern foundry iron are steady at \$17.50 a ton, base, local furnace. Future buying continues to make headway. Several large inquiries are said to total over 8000 tons. An Indiana melter will buy 600 tons of foundry iron and a like amount of malleable iron. An inquiry is in the market for 200 tons of 15 per cent silvery. This commodity has not moved rapidly from local docks, where fully 8000 tons is being held. A sizable tonnage of Southern iron has been placed in this market at a shade under \$11 a ton, Birmingham. Small orders are bringing \$11 at the furnace. Some of the tonnage now being disposed of in this territory at concessions in prices is sand cast pig iron taken from furnace stocks which in the future will consist of the machine cast product.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75	
to 2.25	\$17.50
N'th'n No. 1 fdy., sil. 2.25	
to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil.	
1.50	27.04
S'th'n No. 2 fdy.	17.51
Low phos., sil. 1 to 2 cop.	
per free	\$28.50 to
Silvery, sil. 3 per cent.	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Warehouse Business

Shipments from Chicago warehouses in the second week of November were close to the weekly average of October. The number of orders being received from day to day is large, but individual requirements are small. Prices are stable.

Hot-Rolled Strip

Use of this commodity has been slowly expanding, and output now ranges from 40 to 50 per cent. Prices for delivery in this district are 1.80c. a lb. for 6 in. and narrower strips and 1.70c. for strips wider than 6 in. To the East, occasional concessions of \$1 a ton are noted.

Cold-Rolled Strip

Although releases have been larger from a few directions, output has not been raised above the range of 25 to 30 per cent of capacity. Automobile plants which are now turning out new models have recently placed orders for rear fender stock. The cold-rolled strip price is steady at 2.63c. a lb., Chicago.

Cast Iron Pipe

Private buying of cast iron pipe remains at quite a satisfactory level for this time of the year. On the other hand, orders and inquiries from municipalities have dropped to a very low point. Williams Bay, Wis., has ordered 11,000 ft. of 4 to 8-in. pipe from the Central Foundry Co. and both Kenosha, Wis., and Milwaukee have placed small tonnages. Two private orders placed within the week not only were of good size but were for immediate delivery. Normally, pipe-laying operations in and around Chicago come to an end about Dec. 15, although there have been years when trench work was carried through to the first of the year. Dry weather prevailing late this fall has been favorable to contractors.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$44 to \$45; 4-in., \$47 to \$48; Class A and gas pipe, \$3 extra.

Rails and Track Supplies

Fresh inquiries for standard-section rails are slow in making their appearance. The only new request for prices is for 10,000 tons for the Wabash. Incidentally, this tonnage is very close to that specified against last year's contract. Specifications for rails, though not in large volume, are relatively steady, and output remains in the range of 25 to 30 per cent of capacity. It is interesting to note that some railroads are still specifying against old contracts, one release this week being for 2000 tons. The track accessory market is quiet, new purchases from various sources

aggregating not more than 1000 tons. Heavier output by the coal mining industry is resulting in revival of interest in light rails. New buying shows rather marked improvement considering the sluggishness of the market in recent months, and inquiries are suggestive of more business to come.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Besse. rails, \$43; light rails, rolled from billets, \$36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

Sheets

Releases and new orders for hot mill products have been somewhat more liberal, and output has been advanced to a range of 50 to 60 per cent of capacity. Distribution by warehouses has diminished somewhat in the last week or 10 days, but other users in well diversified lines have found wider need of sheets. New business is all for prompt shipment.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.15c.; No. 10 blue ann'l'd, 2.05c. to 2.15c. *Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.*

Wire Products

Wire mills in this district are preparing to step up production, which is the usual procedure at this time of year, when plans are laid to prepare stocks for spring demand. According to plans now formulated, output by the end of the week will range from 40 to 45 per cent of capacity. Although first quarter books have not been opened, there is growing interest among consumers in first quarter needs.

Ferroalloys

Shipments of these commodities are low in conformity with output by local steel mills and steel foundries. Although stocks have been reduced, there is still a liberal quantity of spiegeleisen on local docks. The impression is gaining ground here that 1931 prices for ferroalloys will vary little from present quotations.

Bolts, Nuts and Rivets

Specifications for these commodities remain spotty. Automobile manufacturers not only have taken larger quantities in the past week, but fresh inquiries from this source are distinctly encouraging. Needs by the farm implement group remain spotty, though tractor builders still have fair programs.

Reinforcing Bars

Encouragement in this market comes only from the fact that some old inquiries are taking on new life. Fresh requests for prices are of little moment and when they do appear they are generally of small size. The outlook for the new year is uncertain beyond the tonnage which will appear for roadwork and Chicago's subway. Numerous road contracts have been placed this fall, steel for which will

be placed in time for early spring construction. The subway plans are undergoing a revision that will require several weeks. Preliminary estimates of the reinforcing bars needed for the first section place the tonnage at 38,000. Prices for reinforcing bars are not firm.

Structural Material

Although new business continues to take form, there is not much to indicate that many orders will reach shops between now and the end of the year. Bids have been entered on the 1600-ton bridge program for the Great Northern. The Milwaukee road and the Chicago & North Western are taking figures on some bridge work. The Illinois Steel Co.'s expansion program is well completed so far as shop work is concerned.

Bars

Improvement in the use of bars, first noted several weeks ago, continues, as evidenced this week by specifications that are fully double those of last week. Releases so far in November are well above those of the like period in October. The use of mild steel bars is broadening not only in tonnage but also as to consuming industries.

Iron bars are again coming into wider use as more Western railroad shops increase the number of employed. Automobile builders which are bringing out new models are making themselves felt in the alloy steel bar market. Output of alloy bars is up a shade to a full 50 per cent of capacity. The rail steel bar market shows no change from a week ago.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes.....	3.00c.
Soft steel bars.....	2.90c.
Reinforc'g bars, billet steel—	
Less than 5 tons.....	2.85c.
5 tons to 30 tons.....	2.45c.
30 tons to 200 tons.....	2.00c.
200 tons and over.....	1.75c.
Rail steel reinforcement—	
Less than 5 tons.....	2.50c.
5 tons to 30 tons.....	2.10c.
30 tons and over.....	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.35c.
Flats and squares.....	3.85c.
Bands $\frac{1}{4}$ in. (in Nos. 10 and 12 gages).....	3.10c.
Hoops (No. 14 gage and lighter).....	3.65c.
Black sheets (No. 24).....	3.30c.
Galv. sheets (No. 24).....	4.35c.
Blue ann'l'd sheets (No. 10).....	3.35c.
Spikes ($\frac{1}{4}$ in. and larger).....	3.55c.
Track bolts.....	4.55c.
Rivets, structural.....	4.00c.
Rivets, boiler.....	4.00c.
	Per Cent Off List
Machine bolts.....	60 and 10
Carriage bolts.....	60 and 10
Coach or lag screws.....	60 and 10
Hot-pressed nuts, sq., tap. or blank, 60 and 10	
Hot-pressed nuts, hex., tap. or blank, 60 and 10	
No. 8 black ann'l'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg.....	\$2.30 to 2.55
Cement c't'd nails, base per keg.....	2.30 to 2.55

Coke

Shipments of by-product foundry coke are steady. The price is firm at \$8 a ton, local ovens.

Old Material

A purchase of 10,000 tons of heavy melting steel at \$10.50 a gross ton delivered, Gary, has taken some of the strain from this market. Concurrent with this order are larger acceptances by other mills, and for the time being incoming tonnages will be absorbed. The removal of the threat of distress tonnage and the action of prices in the last few days are causing dealers to reverse their attitude and few of them now are willing to sell short. In fact, sellers are diligently trying to cover outstanding orders. Rerolling rails have sold off 50c. and the new price level seems to be well established. Low prices for many specialties are causing producers to withhold them from the market, thereby lending assistance to price stability. Railroad offerings are 3000 tons by the Rock Island and 1000 tons by the Chicago & Alton.

Prices deliv'd Chicago district consumers:

	Per Gross Ton
Basic Open-Hearth Grades:	
Heavy melting steel.....	\$10.00 to \$10.50
Shoveling steel.....	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings.....	7.75 to 8.25
No. 1 busheling.....	7.50 to 8.00
Forg'd cast and r'l'd steel carwheels.....	13.50 to 14.00
Railroad tires, charg. box size.....	13.50 to 14.00
Railroad leaf springs cut apart.....	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coil springs.....	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings.....	9.25 to 9.75
Low phos. punchings.....	11.50 to 12.00
Low phos. plates, 12 in. and under.....	11.50 to 12.00
Blast Furnace Grades:	
Axle turnings.....	5.75 to 6.25
Cast iron borings.....	4.00 to 4.50
Short shoveling turnings..	4.75 to 5.25
Machine shop turnings....	4.75 to 5.25
Rolling Mill Grades:	
Iron rails.....	11.00 to 11.50
Rerolling rails.....	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft..	12.50 to 13.00
Steel rails, less than 2 ft..	13.00 to 13.50
Angle bars, steel.....	12.00 to 12.50
Cast iron carwheels.....	11.75 to 12.25
Malleable Grades:	
Railroad.....	12.50 to 13.00
Agricultural.....	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier.....	26.00 to 31.00
	Per Net Ton
Rolling Mill Grades:	
Iron angle and splice bars.	10.50 to 11.00
Iron arch bars, and transoms.....	11.00 to 11.50
Iron car axles.....	20.00 to 21.00
Steel car axles.....	13.00 to 13.50
No. 1 railroad wrought....	8.50 to 9.00
No. 2 railroad wrought....	8.75 to 9.25
No. 1 busheling.....	6.50 to 7.00
No. 2 busheling.....	4.50 to 5.00
Locomotive tires, smooth..	12.50 to 13.00
Pipes and flues.....	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast.....	9.50 to 10.00
No. 1 railroad cast.....	9.00 to 9.50
No. 1 agricultural cast....	8.50 to 9.00
Stove plate.....	7.50 to 8.00
Grate bars.....	7.00 to 7.50
Brake shoes.....	7.25 to 7.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

CLEVELAND

Demand for Steel from Automobile Industry Gains Slightly

CLEVELAND, Nov. 18.—Demand for finished steel gained slightly the past week as a result of the placing of orders by three or four of the motor car companies that have already started or will start in December on the production of new models. While the larger part of the new tonnage came from the Michigan territory, some of the business was placed by Ohio companies making motor car parts. There was also quite an increase in the number of small-lot orders placed in this territory. The gain in business was largely in sheets and hot and cold-rolled strip steel, although alloy steel orders showed some increase.

The Chevrolet Motor Co. purchased some auto body sheets for parts other than car bodies and has sent out inquiries for its steel requirements for the first quarter. Parts makers have received additional inquiries from automobile manufacturers for parts for the first quarter and longer, one desiring to contract until Aug. 1.

While business with some of the mills making the heavier rolled steel products shows no gain, orders received by a leading producer so far this month increased 25 per cent over those of the corresponding period in October, the gain being mostly in structural shapes.

For the second consecutive week, Cleveland mills have increased operations, having put on four open-hearth furnaces. These mills are now operating at 44 per cent of ingot capacity, compared with 20 per cent the first of the month. Aside from some increase by plants making automobile parts, operations by metal-working plants in this territory show no gain.

The only price changes are an advance by two mills in the Cleveland base on steel bars for outside shipment and a decline on fender stock.

Pig Iron

More interest is being shown in the market by some of the larger consumers. One producer has been asked to quote prices for the first half, but declined to go beyond the first quarter. Another favorable factor is that shipments by some furnaces show a gain. One interest reports an increase of 10 to 15 per cent in shipments this month over those of October. Considerable of this gain is due to releases by foundries that make castings for automobile companies that are getting away on new models. Sales declined during the past week, during which Cleveland interests sold 8500 tons.

While prices are unchanged, the market has a slightly firmer tone. Lake furnaces quote foundry and malleable iron at \$16 to \$17, furnace, except for Michigan shipment, where the price range is \$17.50 to \$18. For

Cleveland delivery local furnaces quote \$17.50.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25.....	\$17.50
S'th'n fdy., sil. 1.75 to 2.25.....	17.51
Malleable	17.50
Ohio silvery, 8 per cent.....	25.00
Stand. low phos., Valley.....	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

Iron Ore

Consumption of Lake Superior ore during October amounted to 3,050,060 tons, a decrease of 231,513 tons from September. This compares with 5,365,813 tons consumed in October last year. Furnace stocks Nov. 1 were 34,750,072 tons and ore at furnace and Lake Erie docks amounted to 41,091,608 tons, against 41,119,812 tons on the same date a year ago. There were 100 furnaces in blast Oct. 31 using Lake ore, a decrease of 12 for the month.

Semi-Finished Steel

Specifications for sheet bars show some gain and the leading local producer is now operating six open-hearth furnaces as compared with three a week ago. Inquiry for 5000 tons of sheet bars a week has been put out by an Ohio consumer, which is considering buying semi-finished steel for some of its plants rather than supplying its outside mills from its own steel plant.

Sheets

Orders placed with some of the mills improved during the week, and a few of the Ohio mills increased operations this week. Two or three automobile manufacturers in the Detroit territory bought some tonnage for new car models, and a slight gain is reported from scattered sources. Several makers of metal partitions and doors are still maintaining good operations. Business with barrel manufacturers is about normal for November, which is one of their slowest months of the year.

There is little change in the price situation. While concessions of \$2 a ton on auto body sheets to 3.30c., Pittsburgh, are reported in Detroit, this price does not seem to have appeared in this market. Auto body seconds, which have been weak, with \$38 a net ton a common price, and even lower being quoted, are firmer, some mills now holding these at \$45 a ton.

Bolts, Nuts and Rivets

Bolt and nut manufacturers report a slight improvement in orders from motor car manufacturers and from jobbers. Rivets continue very dull, although inquiry has improved for

fair-sized lots from shipyards on the Eastern and Western coasts.

Plates, Shapes and Bars

Steel bars have been advanced \$1 a ton to 1.65c., Cleveland, by two outside mills when using a Cleveland base for outside shipment. For local delivery, the price is unchanged at 1.65c., Cleveland. No deviation is reported from the 1.60c. Pittsburgh price on plates and shapes. While demand for soft steel bars continues very dull, there is a little improvement in orders for alloy steel bars. Plates are dull, although one mill reports a slight gain in scattered small-lot orders. Little building work is being figured on.

Strip Steel

Demand for both hot and cold-rolled strip steel has gained a little from recent low levels, improvement coming from the automotive and other industries. Concessions of \$2 a ton from the regular price of 1.60c., Pittsburgh, for wide and 1.70c. for narrow strip appear to have become more frequent for desirable orders. Cold-rolled strip is firm at 2.35c., Cleveland. Fender stock has been marked down \$2 a ton to 3.50c., Cleveland.

Wire Products

Hardware jobbers have reduced nails 15c. a keg to \$2.25 a keg from stock and annealed and galvanized wire and staples \$3 a ton. For mill shipment, they quote nails at \$1.95 a keg.

Old Material

Local and Valley mills have not resumed the taking of scrap, and consequently the market shows virtually no change from a week ago. Some of the yard dealers are loaded with heavy stocks, which they are unable to move.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel..	\$11.00 to	\$11.25
No. 2 heavy melting steel..	10.50 to	10.75
Compressed sheet steel....	10.50 to	11.00
Light bundled sheet		
stampings	9.00 to	9.25
Drop forge flashings.....	10.00 to	10.50
Machine shop turnings....	5.00 to	5.50
Short shovelling turnings..	7.75 to	8.00
No. 1 railroad wrought....	13.00 to	13.50
No. 2 railroad wrought....	14.00 to	14.50
No. 1 bushelling.....	11.00 to	11.50
Pipes and flues.....	9.00 to	9.50
Steel axle turnings.....	12.50 to	13.00
Acid Open-Hearth Grades:		
Low phos., billet bloom and slab crops.....	17.50 to	18.00
Blast Furnace Grades:		
Cast iron borings.....	7.50 to	7.75
Mixed borings and short turnings	7.50 to	7.75
No. 2 bushelling.....	6.75 to	7.00
Cupola Grades:		
No. 1 cast.....	13.00 to	13.50
Railroad grate bars.....	10.00 to	10.50
Stove plate	10.50 to	11.00
Rails under 3 ft.....	16.00 to	16.50
Miscellaneous:		
Rails for rolling.....	16.25 to	16.50
Railroad malleable	13.50 to	14.00

NEW YORK

Railroad Equipment Buying Movement Expected to Get Under Way Soon

NEW YORK, Nov. 18.—No general buying movement is yet under way in the pig iron market, but both formal and informal inquiries are on the increase and sales, at 11,000 tons, are the largest since the last week in September. Part of this tonnage was for shipment outside of this district. The Foran Foundry & Mfg. Co., Flemington, N. J., has closed for 1500 tons for delivery over the next five months. The Worthington Pump & Machinery Corp. has placed 800 tons for Buffalo and 250 tons for Elmwood Place, Ohio. Tippet & Wood, Phillipsburg, N. J., are in the market for 900 tons, while the E. & T. Fairbanks Co., St. Johnsbury, Vt., is inquiring for 500 to 1000 tons. A manufacturer of heating equipment and soil pipe is sounding out the market, but has issued no formal inquiry.

Price competition is severe, and it is becoming increasingly evident that Alabama furnaces are determining the market level throughout most of the country east of the Missouri River. Some Northern furnaces are letting business pass by rather than to meet low competitive prices encountered. The delivered price on one round tonnage recently bought in this territory figured back to base prices of \$10.75, Birmingham, and \$16, eastern Pennsylvania furnace, and it is not definitely known which producer took the business.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25.....	\$20.41 to \$20.91
*Buff. No. 2, del'd east. N. J.	18.78 to 19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25.....	18.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75.....	18.89

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Cast Iron Pipe

Inquiries for gas and water pipe from public utilities willing to accept winter delivery are increasing. Requirements of the United Gas Improvement Co., Philadelphia, total about 7000 tons, and the Consolidated Gas & Electric Co. of Baltimore is asking for about 1400 tons of gas pipe. The Federal Water Service Co., New York, is preparing an inquiry for pipe to be delivered next year, and other public utilities are expected to be in the market for substantial tonnages before the end of the year.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, \$38.90 to \$39.90; 4-in. and 5-in., \$41.90 to \$42.90; 3-in., \$48.90 to \$49.90. Class A and gas pipe, \$3 extra.

Reinforcing Bars

Demand is undergoing seasonal decline. From now until about March 1 the effects of the winter season will

be felt, with shipments declining more than bookings. Prospects for next spring are bright, since an unusual amount of public work is in the making. Figures on part of the vehicular tunnel which is to be built under Manhattan Island and the East River will be taken early next year.

For mill shipment, distributors of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at \$4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

Finished Steel

Developments under way may result in a fairly large railroad equipment buying movement. It is said that nearly all of the leading roads will soon issue inquiries for a total of nearly 50,000 cars. Possibly some locomotives also will be bought. Financial arrangements are being discussed whereby a leading banking house will assure the underwriting of equipment trust certificates at a low rate of interest for 80 per cent of the purchase price of the equipment, and the remaining 20 per cent will be carried on the books of equipment companies to be paid off in small installments. If the program goes through as now being discussed, a total of perhaps 700,000 tons of steel would be required. Some definite action is expected following the meeting in New York this week of the Railway Business Association, which will be attended by most of the executives of railroads and railroad supply companies.

With current steel business at ex-

tremely low ebb, thought is being given mainly to future prospects. The borough of Queens will build a water pipe line, on which bids will be called for in about two weeks. While the amount of steel required has not been estimated, it may amount to 5000 tons. New York City engineers are preparing estimates for the Tri-Borough bridge, for which some ground work is now being done. The bridge itself, on which bids may not be asked until early next year, will take about 20,000 tons of fabricated steel. Another large project in the offing is the East River vehicular tunnel, which will require a large amount of steel shapes and plates, concrete reinforcing bars and cast iron segments. Some of the initial contracts may be let early next year.

An announcement of minimum prices on sheets and strip steel is expected to come from one of the leading producers of these products before the end of the week. Otherwise, there are no developments of note in the price situation.

Coke

By-product coke ovens have opened their books for first half contract business at prices ruling at time of shipment.

Special brands of beehive foundry coke, \$4.70 to \$4.85 a net ton, ovens, or \$8.41 to \$8.56 delivered to northern New Jersey, Jersey City and Newark, and \$9.29 to \$9.44 to New York and Brooklyn; by-product foundry coke, \$9 to \$9.40, Newark or Jersey City; \$10.06, New York or Brooklyn.

Old Material

The buying price of No. 1 heavy melting steel for eastern Pennsylvania delivery has been reduced by brokers to \$11 a ton, delivered, or \$7.50, New York. No. 2 steel is being bought at \$9, delivered Conshohocken, Pa., or \$5.50 a ton, New York. Heavy breakable cast is being bought at \$10.50, delivered Harrisburg, Pa., or \$5.75, New York.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel..	\$7.50
Heavy melting steel (yard) \$5.25 to	5.50
No. 1 hvy. breakable cast..	6.75 to 7.00
Stove plate (steel works)...	5.00
Locomotive grate bars....	5.00
Machine shop turnings....	4.00
Short shovelling turnings....	4.00
Cast borings (blast fur. or steel works)	4.00
Mixed borings and turnings	3.75
Steel car axles.....	16.00
Iron car axles	19.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	7.25
Forge fire	7.00
No. 1 railroad wrought....	8.75
No. 1 yard wrought....	7.75
Rails for rolling.....	9.25 to 9.75
Stove plate (foundry).....	5.50
Malleable cast (railroad)...	9.50 to 10.00
Cast borings (chemical)...	8.50 to 9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	\$13.00
No. 1 hvy. cast (columns, bldg. materials, etc.) : cupola size.....	11.00
No. 2 cast (radiators, cast boilers, etc.)	10.50

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes.....	3.10c.
Soft steel bars, small shapes.....	3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal... 7.00c. to	7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.40c.
Flats and squares.....	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10).....	3.25c. to 3.40c.
Black sheets (No. 24*).....	3.65c. to 3.75c.
Galvanized sheets (No. 24*).....	4.25c.
Long terne sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, ½ x ½ in. and larger... 3.40c.	
Smooth finish, 1 to 2 ½ x ½ in. and larger	3.75c.
Open-hearth spring steel, bases.....	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Machine bolts, cut thread:	Per Cent Off List
¾ x 6 in. and smaller.....	.65
1 x 30 in. and smaller.....	.65

Carriage bolts, cut thread:	Per Cent Off List
¾ x 6 in. and smaller.....	.65
¾ x 20 in. and smaller.....	.65

Bolter Tubes:	Per 100 Ft.
Lap welded, 2-in.	\$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

PHILADELPHIA

Steel Mill Operations Off— Foundry Iron Price Lower

PHILADELPHIA, Nov. 18.—Operations at eastern Pennsylvania steel mills are at little better than 40 per cent of capacity, except for the leading independent interest, which is operating at a slightly higher rate. Steel consumers are apparently covered for their requirements for the rest of the year, especially the large fabricators, which have protection on shapes at about 1.60c. a lb., mill. On the small volume of orders being placed now, however, mills are quoting shapes at 1.70c., mill, and plate producers are quoting 1.70c., Coatesville, Pa.

Bids were opened Nov. 17 by the Pennsylvania Railroad on 42,000 tons of plates, shapes and bars for delivery through the first half of next year. Quotations on the plates, shapes and bars were all at 1.60c. a lb., mill, with the exception of one bid of 1.70c. a lb., f.o.b. Bethlehem, Pa., or Lackawanna, N. Y., on shapes.

A substantial tonnage of fabricated structural steel is pending award here, mostly for large public work, such as the Pennsylvania Avenue improvement for the city, which will require upward of 10,000 tons before completion. Plate mills are interested in a \$1,000,000 welded steel pipe contract in Queens, Long Island. Recent large contracts include gates at Safe Harbor, Pa., awarded to the Newport News Shipbuilding & Dry Dock Co., calling for 1100 tons of plates.

While lack of business has brought about some dismissals by eastern Pennsylvania mills, wages have been reduced in only one instance by a steel mill in this district.

Steel Bars

The price of merchant bars continues at 1.60c., Pittsburgh, or 1.89c., delivered Philadelphia, with buying limited to small lots. Demand for reinforcing bars is fair. Recent awards for reinforced concrete projects include 150 tons for Howard University, Washington, and about 750 tons for a marine barracks at Quantico, Va. Quotations on billet steel bars are unchanged at 1.70c. to 1.75c., Pittsburgh, or 1.99c. to 2.04c., delivered Philadelphia, and rail steel bars are 1.55c., Franklin, Pa., or 1.84c., delivered Philadelphia.

Pig Iron

Except for recent sizable purchases of Southern foundry iron at attractive prices, buying is limited to an occasional carload for immediate needs, or small lots for delivery in the first quarter. Competition is keen, and the usual quotation of eastern Pennsylvania furnaces is \$18 a ton for small tonnages, while substantial lots bring concessions to \$17.50 a ton, furnace. Included in a few hundred tons of small inquiry for first quarter delivery

are 100 tons of foundry grade and 40 tons of charcoal iron for the Baltimore & Ohio Railroad and a carload of foundry for the Seaboard Air Line. Southern pig iron continues active in this district. A Delaware River pipe maker is understood to have closed on a medium-sized tonnage at about \$10 a ton, Birmingham.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	\$18.26 to \$19.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.76 to 19.76
East. Pa. No. 1X.	19.26 to 20.26
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	21.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. brg low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Shapes

Most of the large users of shapes have been protected at about 1.60c. a lb., f.o.b. nearest mill, or 1.66c., Philadelphia, for the rest of this year. On current business, 1.70c., mill, or 1.76c., Philadelphia, is quoted, with only occasional concessions of \$1 a ton on desirable orders. Requirements of the Pennsylvania Railroad for next year, bids on which were opened Nov. 17, include 2000 tons of shapes.

Plates

Eastern Pennsylvania mills are quoting 1.70c., Coatesville, Pa., or 1.80½c., delivered Philadelphia, but with consumers' requirements generally covered for the rest of the year, current buying is limited and mills are operating on restricted schedules. Requirements of the Pennsylvania Railroad for next year include 30,000 tons of plates.

Sheets

While local sheet consumers are maintaining recent operating schedules, buying is meager. Prices are generally unchanged, with blue an-

nealed sheets, No. 13 gage, at 2.05c., Pittsburgh, or 2.34c., Philadelphia, and blue annealed plates, No. 10 gage, at 1.90c., Pittsburgh, or 2.19c., Philadelphia. Black sheets are quoted at 2.35c., Pittsburgh, or 2.64c., Philadelphia, and galvanized are 2.90c. to 3c., Pittsburgh, or 3.19c. to 3.29c., Philadelphia.

Imports

In the week ended Nov. 15, 4950 tons of pig iron arrived at this port from British India and 434 tons of iron ore from Spain. Steel imports consisted of 90 tons of structural shapes, 35 tons of steel bands and 22 tons of plates from Belgium.

Old Material

About 10,000 tons of No. 1 heavy melting steel has been bought by an eastern Pennsylvania consumer at \$12 a ton, delivered. While this is apparently a 50c. a ton advance in price, it actually represents a recession of 50c. a ton from the previous purchase made by the same mill. Other grades of scrap lack firmness. Cast iron carwheels have been sold at \$14.50 a ton, and dealers with supplies have offered to sell at \$14 a ton, delivered, without finding buyers.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel..	\$12.00
No. 2 heavy melting steel..	10.00
Heavy melting steel (yard)	9.50
No. 1 railroad wrought..	\$13.50 to 14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 11.00
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	7.00 to 8.00
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)...	8.00 to 8.50
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars.....	9.00
Stove plate (for steel works)	9.00
No. 1 low phos., hvy., 0.04% and under.....	19.00 to 20.00
Couplers and knuckles....	16.50 to 17.50
Rolled steel wheels.....	15.50 to 16.00
No. 1 blast f'nace scrap...	7.00 to 7.50
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire.....	11.00
Cast iron carwheels.....	14.00 to 14.50
No. 1 cast.....	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling....	13.50 to 14.00

P. N. Guthrie, Jr., vice-president in charge of sales, with headquarters at New York, for the Reading Iron Co., Reading, Pa., was elected president, at a special meeting of the directors at Philadelphia, Nov. 18, to fill the vacancy caused by the resignation of L. E. Thomas.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier.....	2.50c.
Structural shapes.....	2.50c.
Soft steel bars, small shapes, iron bars (except bands).....	2.60c.
Reinforc. steel bars, sq., twisted and deform.....	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex....	3.40c.
Cold-fin. steel, sq. and flats.....	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ½-in. inclu..	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24).....	3.60c.
†Galvanized sheets (No. 24).....	4.15c.
Light plates, blue annealed (No. 10)	3.95c.
Blue ann'l'd sheets (No. 13).....	3.20c.
Diam. pat. floor plates, ¼-in.....	5.20c.
Swedish iron bars.....	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

BOSTON Scrap Market Demoralized—Pig Iron Demand Small—Prices No Firmer

BOSTON, Nov. 18.—Pig iron sales the past week totaled about 3000 tons, of which the Mystic Iron Works took 2300 tons. The price situation is expected to clear soon, if the discontinuance of barge and rail rates from Buffalo has any influence.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25..	\$19.78 to \$20.28
†Buffalo, sil. 2.25 to 2.75..	19.78 to 20.28
*Buffalo, sil. 1.75 to 2.25..	20.41 to 20.91
*Buffalo, sil. 2.25 to 2.75..	20.91 to 21.41
Va., sil. 1.75 to 2.75.....	25.21
Va., sil. 2.25 to 2.75.....	25.71
*Ala., sil. 1.75 to 2.25.....	21.11
*Ala., sil. 2.25 to 2.75.....	21.61
†Ala., sil. 1.75 to 2.25.....	17.25
†Ala., sil. 2.25 to 2.75.....	17.75

Freight rates: \$4.91 all rail and \$4.28 rail and water from Buffalo; \$5.21 all rail from Virginia; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Fabricated Steel

The letting of 1350 tons of steel to the American Bridge Co. for the General Electric Co.'s transformer manufacturing plant at Pittsfield, Mass., was the feature of an otherwise dull week. Fabricators have less business in prospect than at any time this year.

Cast Iron Pipe

As is usual at this time of the year, current buying is confined almost exclusively to car lots. The market on 6 in. and larger pipe holds at \$38 a ton, foundry, and a \$3 differential on Class A and gas pipe is maintained. Hanson and Pembroke, Mass., are negotiating for the purchase of several miles of pipe each, but will not close until 1931.

Old Material

Never within the memory of the trade were scrap prices so demor-

alized nor demand so limited as now. Were it not that the American Steel & Wire Co., Worcester, Mass., continues to buy small car lots of long bundled skeleton and No. 1 heavy melting steel, and a Portland, Me., rolling mill a car of axles now and then, old material brokers might just as well close up. With the constant lowering of prices for material is a growing determination among owners not to sell. No. 1 heavy melting steel for Worcester delivery generally sells at \$7.50 to \$7.60 a ton, on cars shipping point. For eastern Pennsylvania delivery there is also a thin market at \$6.50 to \$6.60 a ton. Machine shop turnings have dropped so low in value that loading charges cannot be realized. As high as \$16 to \$16.50 a ton, on cars shipping

point, is paid for axles for Portland delivery, while the best brokers can do for Pennsylvania delivery is \$14 to \$14.50. Quotations on railroad wrought are tentative, no sales having been made in several weeks.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel..	\$6.50 to \$7.50
Scrap T rails.....	7.10 to 7.60
Scrap girder rails.....	6.10 to 6.60
No. 1 railroad wrought....	7.50 to 7.60
Machine shop turnings....	2.50 to 3.10
Cast iron borings (steel works and rolling mill)	3.00 to 3.25
Bundled skeleton, long....	6.00 to 6.50
Forge flashings.....	6.00 to 6.50
Blast furnace borings and turnings	2.50 to 2.75
Forge scrap	5.75 to 6.00
Shafting	12.50 to 13.50
Steel car axles.....	14.00 to 16.50
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.00 to 6.50
Rails for rolling.....	10.00 to 10.25
Cast iron borings, chemical	9.00 to 9.50
Prices per gross ton deliv'd consumers' yards:	
Textile cast	\$11.00 to \$11.50
No. 1 machinery cast....	11.50 to 12.50
No. 2 machinery cast....	10.00 to 10.50
Stove plate	8.00 to 8.50
Railroad malleable	14.00 to 14.50

BIRMINGHAM Pig Iron Buying Not Influenced By American Radiator Purchase

BIRMINGHAM, Nov. 18.—The recent large pig iron order placed by the American Radiator Co. did not effect any change in the attitude of buyers generally toward the market. Buying in the last week was composed of the usual run of small spot orders. Shipments were off a little as compared with the first week of the month, but so far melters have not used the approaching inventory period as an excuse for curtailing shipments. It is estimated that there has been a little gain in furnace stocks this month. Furnace interests do not feel that shipments will show the percentage of decline in the next three or four weeks that they have at such periods in the past, as melters have very light stocks.

Active blast furnaces continue at 10 for the seventh consecutive week. Only one furnace is producing basic iron, all others being on foundry iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.....	\$14.00
No. 1 fdy., 2.25 to 2.75 sil.....	14.50
Basic	14.00

Finished Steel

More uncertainty has crept into demand during the past 10 days, despite the fact that the amount of new business has held up to the recent average. Efforts to rush certain construction projects before winter weather sets in have caused a stronger demand in some cases, and in other lines there has been some easing up. So far this season rail buying has been confined to three orders, aggregating 15,000 to 20,000 tons. Heavier buying of rails is expected before the end of the year, as some important tonnages are under negotiation.

Structural steel orders were light, but fabricators report that they ex-

pect to close on three important jobs this week. The Ingalls Iron Works Co. has booked 250 tons for a new building to house pig iron casting machines of Woodward Iron Co. Pending work includes 6000 to 7000 tons for Nov. 21 letting of highway bridges in Tennessee and about 400 tons for underpasses at Birmingham to be awarded Dec. 4. Current demand for reinforcing bars is lower than in weeks. The only bright spot ahead appears in heavy road and bridge building programs in Louisiana and Tennessee. Buying on these is expected to begin in December.

Nine open-hearths remain active—five at the Fairfield works of the Tennessee company and four at the Alabama City works of the Gulf States Steel Co. The other 14 open-hearths in the district have been idle for several weeks.

Cast Iron Pipe

The United States Pipe & Foundry Co. was low on 3200 tons of pipe for Ft. Worth, Tex. Lawton, Okla., is expected to open bids about Dec. 1 on 12,000 ft. of 24-in. pipe. Holdenville, Okla., will open bids Nov. 25 on 4000 ft. of 16-in. pipe. There are indications that some winter buying will be delayed until after the first of the year. Some important tonnages are promised from utility sources. Prices hold well at \$37 to \$38, Birmingham. Plant operations have eased up a little, but they are not far under what they were 30 days ago. Compared with a year ago, operations are said to be about 10 per cent less.

Coke

There is no change apparent in the very light movement of foundry and industrial coke. The Tennessee company has placed 22 more ovens in

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams.....	3.365c.
Tees	3.365c.
Zees	3.365c.
Soft steel bars, small shapes.....	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds.....	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	3.50c. to 5.55c.
Squares and flats.....	4.00c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler.....	4.50c.
Per Cent Off List	
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts	60 and 5
Cold-punched nuts	60 and 5
Stove bolts	70 and 10

operation, making 230 ovens active of 497. Active ovens in the district total 934 of 1390.

Old Material

Recent inquiries have not developed an appreciable increase in new business, though there is just a little better feeling in the market. Steel grades show more promise of early activity than do cast grades. Quotations on stove plate are off 50c. a ton at \$9. Steel axles are off \$1 a ton at

\$19. Iron axles, cast iron car wheels and No. 1 cast are inactive.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel.....	\$10.00 to \$10.50
Scrap steel rails.....	11.00 to 11.50
Short shoveling turnings..	9.00
Cast iron borings	9.00
Stove plate	9.00
Steel axles	19.00
Iron axles	18.00
No. 1 railroad wrought...	10.00
Rails for rolling.....	11.50 to 12.00
No. 1 cast.....	11.00 to 11.25
Tramcar wheels	11.00 to 11.25
Cast iron borings, chem....	13.50
Cast iron carwheels.....	11.00

PACIFIC COAST

Orders Placed for 600 Car Frames Taking 3000 Tons of Steel

SAN FRANCISCO, Nov. 15.—(By Air Mail)—Both sales of and inquiries for steel products on the Pacific Coast reflect the inactivity noted in most lines of business. Little or no improvement is now looked for until after the first of the year. Prices, however, are holding fairly well.

Outstanding awards included 3000 tons of shapes and plates for 600 car frames which the Western Pipe & Steel Co. will fabricate for the Pacific Fruit Express Co., San Francisco, and 600 tons of shapes for the Engineers' Building for the University of California, Berkeley, secured by the Pacific Coast Engineering Co.

Bars

Reinforcing steel bar awards exceeded 900 tons. W. C. Hauck Co. took 268 tons for a hospital in Stockton, Cal., and an unnamed interest secured 350 tons for an apartment building on Sunset Boulevard, Los Angeles. The only new inquiry of importance involves 400 tons for a bridge at Coquille, Ore., bids on which will be opened Dec. 8. Prices on out-of-stock material both in the San Francisco and Los Angeles districts continue firm at 2.50c., base, on car-load lots.

Plates

The Bethlehem Shipbuilding Corp., San Francisco, booked 250 tons for a 129-ft. steel tug for Young Brothers, Ltd., Honolulu. Bids have been opened on 3000 tons for a cruiser to be built at the Mare Island Navy Yard. No action has yet been taken on 390 tons for a 24-in. welded steel pipe line for Oakland, Cal. Bids will be opened Dec. 2 on 34,320 ft. of 36-in., 45-in. and 48-in. welded steel, cast iron or reinforced concrete pipe for

Warehouse Prices, f.o.b. San Francisco

Base per Lb.	
Plates and struc. shapes.....	3.40c.
Soft steel bars.....	3.40c.
Black sheets (No. 24).....	4.35c.
Blue ann'l'd sheets (No. 10).....	3.80c.
Galv. sheets (No. 24).....	5.00c.
Struc. rivets, 1/2-in. and larger.....	5.00c.
Com. wire nails, base per keg....	\$3.35
Cement c't'd nails, 100 lb. keg....	3.35

Pig iron prices per gross ton at San Francisco:

*Utah basic.....	\$22.00 to \$24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to 24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to 24.00
*Delivered San Francisco.	
**Duty paid, f.o.b. cars San Francisco.	

Phoenix, Ariz. Santa Cruz, Cal., will open bids Nov. 17 for 350 tons for a 20-in. welded steel pipe line. Prices range between 2.05c., and 2.15c., c.i.f.

Structural Shapes

Several new inquiries of size have come up for figures during the past 10 days. Bids will be opened Dec. 1 on 521 tons for the First Street bridge at San Diego and Dec. 3 on 787 tons for the Polga River bridge in Butte County, Cal. Approximately 7500 tons is involved in the new

ST. LOUIS

Better Buying of Steel Expected Next Month for January Shipment

ST. LOUIS, Nov. 18.—While none of the 50,000 tons of pig iron bought by a leading radiator manufacturer was placed in this market, the fact that such a large tonnage was placed has had a good effect on conditions in the trade, and the hope is expressed that it will tend to stimulate other large buyers to action. Little actual business was placed here during the week, however, with makers of either Northern or Southern pig iron. Business with the jobbing foundries is said to show further improvement, and there is a seasonal activity with the stove manufacturing interests, but malleable foundries' trade is at a standstill. Steel plants are making no new commitments for basic iron.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill....	\$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	\$15.42 to 15.92
Northern malleable, deliv'd	19.16 to 19.66
Northern basic, deliv'd....	19.16 to 19.66

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Olympic Club building, bids on which go in Nov. 17. Bids have been opened on 300 tons for plate girders for bridges for the Western Pacific Co. The Austin Co. took 266 tons for a plant addition in Spokane for the Inland Empire Paper Co. Shapes range from 2.15c., to 2.25c., c.i.f.

Cast Iron Pipe

Activity was more pronounced and several fair-sized lots were placed. The United States Pipe & Foundry Co. took 100 tons of 16-in. Class 150 pipe for Eureka, Cal. Seattle placed 100 tons with an unnamed interest. The American Cast Iron Pipe Co. booked 500 tons for the White River Lumber Co., Enumclaw, Wash., and 105 tons of 4 to 8-in. Class B pipe for Anaheim, Cal. Bids have been opened on 260 tons for Hoquiam, Wash.

Steel Pipe

The Pacific Gas & Electric Co., San Francisco, has placed 40,000 ft. of 12-in. gas pipe, involving 600 tons, with an unnamed interest. Demand for oil country goods has shown little improvement. Movement of standard steel pipe is confined to small lots for the most part and stocks in distributors' warehouses are well rounded out.

Track Material

The American Steel Foundries were low bidders at \$30 for 500 34-in. steel car wheels and at \$27 for 48 28-in. wheels for the Municipal Railway, San Francisco. The Pacific Coast Forge Co. secured 4200 kegs of track spikes, involving 500 tons, for the Northern Pacific Railway at Seattle.

Finished Steel

Buyers continue to specify for immediate requirements only, as they desire to keep their stocks and inventories at the minimum at the end

Warehouse Prices, f.o.b. St. Louis

Base per Lb.	
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24).....	4.25c.
Galv. sheets (No. 24).....	4.60c.
Blue ann'l'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.10c.
Galv. corrug. sheets	4.70c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
Per Cent Off List	
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb.....	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.....	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

of the year, according to the Granite City Steel Co., which believes that a little later on they will deem it advisable to balance up their inventories, and therefore will undoubtedly place specifications during December for shipments after Jan. 1. The demand for sheets in general is disappointing, but there is reason to feel encouraged with respect to tin plate, as users already have begun to specify quite liberally for January shipment, some to be made promptly after Jan. 1. Prices are firmer.

Old Material

Things were looking up in the old material trade this week, with the placing of an order for approximately 5000 tons of heavy melting steel by an East Side mill for delivery within the next 60 days, the order having been divided among three dealers. A fair-sized order for miscellaneous rails also was placed. Other items are quiet, and the market as a whole is weak.

Railroad lists, which were the heaviest in weeks, follow: Chesapeake & Ohio, 4523 tons; Chicago, Burlington & Quincy, 4180 tons; New York Central, 3000 tons (relaying rails); Louisville & Nashville, 2395 tons; International Great Northern, 1800 tons; St. Louis-San Francisco, 1000 tons;

Chicago, Rock Island & Pacific, 85 carloads; New York, Chicago & St. Louis, 42 carloads; Chicago, Milwaukee, St. Paul & Pacific, 25 carloads; Nashville, Chattanooga & St. Louis, 14 carloads; Pullman Co. (St. Louis), 4 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	\$11.00 to \$11.50
No. 1 heavy melting or shoveling steel.....	10.00 to 10.50
No. 2 heavy melting or shoveling steel.....	9.25 to 9.75
No. 1 locomotive tires....	11.00 to 11.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart....	10.00 to 10.50
Railroad springs	12.75 to 13.25
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought....	10.00 to 10.50
No. 1 bushing	7.00 to 7.50
Cast iron borings and shoveling turnings	6.00 to 6.50
Iron rails	10.00 to 11.00
Rails for rolling.....	11.50 to 12.00
Machine shop turnings....	3.50 to 4.00
Heavy turnings	8.00 to 8.50
Steel car axles	15.00 to 15.50
Iron car axles	20.50 to 21.00
Wrot. iron bars and trans.	13.00 to 13.50
No. 1 railroad wrought....	7.50 to 8.00
Steel rails, less than 3 ft..	13.00 to 13.50
Steel angle bars.....	10.50 to 11.00
Cast iron carwheels.....	11.00 to 11.50
No. 1 machinery cast.....	10.50 to 11.00
Railroad malleable	10.25 to 10.75
No. 1 railroad cast.....	10.00 to 10.50
Stove plate	8.50 to 9.00
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	10.00 to 10.50

of the Carnegie Steel Co. in announcing minimum quotations of 1.60c., Pittsburgh, on plates, shapes and bars. Talk of advances throughout the entire range of flat-rolled products is heard, but no company had taken official action at this writing. In some cases consumers are making some effort to determine the first quarter price, and as a result it is expected that at least one mill will have an official announcement to make along this line in the near future. It is not likely that any sharp advance could be held, but stabilization at the present maximum quotations to large buyers might not be difficult of achievement. Quotations are so weak at the present time that any move to stabilize would be welcome, even though no efforts were made to increase returns materially.

Black sheets are pretty generally quoted at 2.35c., Pittsburgh, with occasional small lots bringing a higher price. On galvanized the market ranges from 2.90c. to 3c., with the lower figure confined principally to jobbers, but extended here and there to the trade. Jobbing mill light plates are well maintained at 1.90c. to 2c., while prices lower than 2.05c. on No. 13 gage blue annealed sheets are seldom encountered. Continuous mills are quoting 1.70c. to 1.80c. on the No. 10 gage, and 1.85c. to 1.90c. on the No. 13 gage. Hot-rolled strip is quotably weaker, with concessions of \$1 a ton from the 1.60c. and 1.70c., Pittsburgh, prices now being too general to ignore. Cold-rolled strip is still quoted at 2.35c., Pittsburgh or Cleveland, but concessions of \$1 and \$2 a ton are not uncommon. Wire nails range from \$1.90 to \$2 per keg, while manufacturers' wire continues at 2.30c., Pittsburgh. Semi-finished steel prices are nominally unchanged and are being given little test in the present market.

Pig Iron

The Valley pig iron market is still depressed and is limited by competition of Buffalo and Cleveland furnaces. While not competing in the immediate Valley district, outside districts are forcing Valley makers to meet lower delivered prices in competitive territory, and the present quotation of \$17, Valley furnace, on foundry and basic iron, and \$17.50 on Bessemer and malleable apply only in a very limited territory. The only two merchant stacks operating in the district are supplying ingot mold foundries, and both would probably be down otherwise.

Old Material

Scrap prices are weak and lack definition because of the absence of mill purchases. However, dealers seem unwilling to make sales of No. 1 heavy melting steel at less than \$13, and this would probably represent the bottom of the mill buying market unless distress material was involved. Hydraulic compressed sheets are slightly lower, and the other grades of scrap have declined in sympathy.

YOUNGSTOWN Price Stabilization Movements Expected in Flat-Rolled Products

YOUNGSTOWN, Nov. 17.—Activity in the Valley steel industry approached the low levels of 1921 during the first half of this month. Last week independent open-hearth operations scarcely averaged 25 per cent of potential capacity, with the Steel Corporation plants in the district doing somewhat better. This week, however, some improvement is in prospect as several furnaces have been placed in operation, and about a third of the district's independent open-hearth capacity is now running. Finishing mill schedules have averaged somewhat higher, and the very low rate of raw steel production was likely occasioned by a desire on the part of the larger companies to reduce their inventories of ingots and unfinished steel to a minimum prior to the year-end. The State of Ohio requires a heavy inventory tax which will be more of a burden than usual this year.

Finished Steel

Specifications for finished steel products have fallen slightly under those of September and October, but orders from the automobile industry have been somewhat larger in a few cases and are expected to improve during December in anticipation of higher motor car production during January. The introduction of new models in the automobile industry has not brought much business from a

volume standpoint, but a number of small orders have resulted which will likely be duplicated in a larger way as producers determine the public reception accorded their new units. The other steel consuming industries served by Youngstown mills are generally ordering light tonnages.

Shipments of electric welded and seamless pipe continue heavy as a result of orders placed during the summer, but not much new business is coming out, and there is a prospect of a sharp curtailment in output between the time when present orders are completed and new business begins to develop during the spring. Standard pipe has been unusually dull for the fall season, but reports of increasing building activity in various parts of the country indicate a comeback before many months have passed. Other industries in the Youngstown territory which depend on the building industry for their prosperity are naturally running at reduced rates, but some of them are deriving considerable tonnage from reinforcing bar jobs which continue to develop in various parts of the country. Steel office furniture is dull, and there is little demand for metal lath and other sheet steel building products. Steel plate fabricators are moderately well occupied with tank work, and makers of rolling mill machinery and equipment are busy.

Valley mills have followed the lead

BUFFALO

Steel Plant Operations Decline Further— Pig Iron Sales 3000 Tons

BUFFALO, Nov. 18.—Sales of pig iron in this district in the past week amounted to about 3000 tons, made up of small lots. So far as can be learned, the largest sale was 250 tons. Sizable inquiries are very rare, with the exception of a lot of 1000 tons of foundry. Buffalo district prices remain the same, and there is some indication that the Buffalo prices on Eastern shipment are stiffening slightly. The fact that another furnace will go out of blast about Dec. 1 may be responsible for this.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.....	\$17.50
No. 2X fdy., sil. 2.25 to 2.75.....	18.00
No. 1 fdy., sil. 2.75 to 3.25.....	19.00
Malleable, sil. up to 2.25.....	18.00
Basic.....	17.50
Lake Superior charcoal.....	27.28

Old Material

About the only activity in this territory is the shipping against a recent mill order at \$11.50 for No. 1 heavy melting steel and \$10 for No. 2. It is understood that the amount contracted for was 5000 instead of 10,000 tons, but that the remainder may be made up at any time. Prices of scrap are not stiffening.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel..	\$11.50
No. 2 heavy melting scrap..	10.00
Scrap rails.....	\$12.00 to 12.50
Hydraul. comp. sheets.....	10.00
Hand bundled sheets.....	8.00 to 8.50
Drop forge flashings.....	10.00
No. 1 busheling.....	10.00
Hvy. steel axle turnings.....	11.00 to 11.50
Machine shop turnings.....	6.00 to 6.50
No. 1 railroad wrought....	10.00 to 10.50

Acid Open-Hearth Grades:	
Knuckles and couplers....	14.00 to 14.50
Coil and leaf springs.....	14.00 to 14.50
Rolled steel wheels.....	14.00 to 14.50
Low phos. billet and bloom ends.....	15.00 to 15.50

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Soft steel bars.....	3.15c.
Reinforcing bars.....	2.95c.
Cold-fin. flats and sq.....	3.65c.
Rounds and hex.....	3.15c.
Cold-rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.60c.
Bands.....	3.50c.
Hoops.....	3.90c.
Blue ann'l'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$2.60
Black wire, base per 100 lb.....	3.20

Electric Furnace Grades:	
Short shov. steel turnings..	8.50 to 9.00
Blast Furnace Grades:	
Short mixed borings and turnings.....	7.00 to 7.50
Cast iron borings.....	7.00 to 7.50
No. 2 busheling.....	6.00

Rolling Mill Grades:	
Steel car axles.....	15.00 to 15.50
Iron axles.....	19.00 to 19.50
Cupola Grades:	
No. 1 machinery cast.....	10.25 to 11.00
Stove plate.....	9.50 to 10.00
Locomotive grate bars.....	8.25 to 9.25
Steel rails, 3 ft. and under	15.00 to 15.50
Cast iron carwheels.....	13.50 to 14.00

Malleable Grades:	
Industrial.....	14.00 to 14.50
Railroad.....	14.00 to 14.50
Agricultural.....	14.00 to 14.50

Special Grades:	
Chemical borings.....	11.50 to 12.00

Finished Steel

Operation of mills in this territory shows a falling off from last week's schedule. The Lackawanna plant of the Bethlehem Steel Co. has reduced its number of open-hearths by two and is now running 11. The Wickwire-Spencer Steel Co. is operating two open-hearths; the Donner plant of Republic, four, and the Gould Coupler Co., one.

to order in small quantities for immediate shipment, but they do not anticipate their requirements for more than 30 days.

Old Material

With mills still holding up shipments on contracts and virtually no new business to be had, district scrap dealers are doing very little. Most of the material purchased in being piled in the yards.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$10.00 to \$10.50
Scrap rails for melting.....	11.00 to 11.50
Loose sheet clippings.....	6.00 to 6.50
Bundled sheets.....	9.25 to 9.75
Cast iron borings.....	5.00 to 5.50
Machine shop turnings.....	5.50 to 6.00
No. 1 busheling.....	8.50 to 9.00
No. 2 busheling.....	5.50 to 6.00
Rolls for rolling.....	12.00 to 12.50
No. 1 locomotive tires.....	12.50 to 13.00
No. 2 railroad wrought....	10.00 to 10.50
Short rails.....	15.25 to 15.75
Cast iron carwheels.....	11.00 to 11.50
No. 1 machinery cast.....	14.50 to 15.00
No. 1 railroad cast.....	12.50 to 13.00
Burnt cast.....	7.00 to 7.50
Stove plate.....	7.00 to 7.50
Brake shoes.....	7.00 to 7.50
Agricultural malleable....	12.50 to 13.00
Railroad malleable.....	13.50 to 14.00

Detroit Scrap Market Shows Further Weakness

DETROIT, Nov. 18.—With the close of navigation near at hand and very little buying support, the scrap market has shown further signs of weakness, with a general decline of 25c. a ton.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel.....	\$9.75 to \$10.25
Borings and short turnings	4.50 to 5.00
Long turnings.....	3.75 to 4.25
No. 1 machinery cast.....	10.00 to 10.50
Automotive cast.....	11.75 to 12.25
Hydraul. comp. sheets....	9.50 to 10.00
Stove plate.....	7.25 to 7.75
New No. 1 busheling.....	8.50 to 9.00
Old No. 2 busheling.....	3.75 to 4.25
Sheet clippings.....	6.50 to 7.00
Flashings.....	8.50 to 9.00

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
New billet reinf. bars.....	3.15c.
Rail steel reinf. bars.....	3.00c.
Hoops.....	3.90c.
Bands.....	3.35c.
Cold-fin. rounds and hex.....	3.80c.
Squares.....	4.30c.
Black sheets (No. 24).....	4.05c.
Galvanized sheets (No. 24).....	4.90c.
Blue ann'l'd sheets (No. 10).....	3.45c.
Structural rivets.....	4.20c.
Small rivets.....	.60 per cent off list
No. 9 ann'l'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg (25 kegs or more).....	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.....	10.25
Net per 100 Ft.	
Lap-welded steel boiler tubes, 2-in..	\$16.50
4-in.....	34.50
Seamless steel boiler tubes, 2-in....	17.50
4-in.....	36.00

CINCINNATI

Pig Iron Melters Restricting Purchases— Scrap Market Continues Dull

CINCINNATI, Nov. 18.—With the melt low and district consumers restricting purchases in anticipation of the annual inventory period, sales of pig iron in the last week were few. In fact, in one or two instances furnace representatives reported no sales for the week. The total tonnage placed was about 1470 tons, of which 300 tons was Southern iron. A southern Ohio consumer bought 250 tons of Northern foundry iron and a north central Ohio melter took 125 tons of Southern foundry. An Indiana consumer is inquiring for 1200 tons of

Northern iron for first quarter shipment.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25.....	\$20.89 to \$21.39
Ala. fdy., sil. 1.75 to 2.25..	14.69 to 15.19
Ala. fdy., sil. 2.25 to 2.75..	15.19 to 15.69
Tenn. fdy., sil. 1.75 to 2.25.	14.69 to 15.19
S'th'n Ohio silvery, 8 per cent.....	24.39

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Finished Steel

The district sheet market is quiet and featureless. Consumers continue

▲▲ Semi-Finished Steel, Raw Materials, Bolts and Rivets ▲▲

Mill Prices of Semi-Finished Steel

Billets and Blooms	
	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	\$31.00
Rerolling, 4-in. and under 10-in., Youngstown	31.00
Rerolling, 4-in. and under 10-in., Cleveland	31.00
Rerolling, 4-in. and under 10-in., Chicago	32.00
Forging quality, Pittsburgh	36.00

Sheet Bars	
	Per Gross Ton
(Open Hearth or Bessemer)	
Pittsburgh	\$31.00
Youngstown	31.00
Cleveland	31.00

Slabs	
	Per Gross Ton
(8 in. x 2 in. and under 10 in. x 10 in.)	
Pittsburgh	\$31.00
Youngstown	31.00
Cleveland	31.00

Skelp	
	Per Lb.
(F.o.b. Pittsburgh or Youngstown)	
Grooved	1.60c. to 1.70c.
Universal	1.60c. to 1.70c.
Sheared	1.60c. to 1.70c.

Wire Rods	
	Per Gross Ton
(Common soft, base)	
Pittsburgh	\$36.00
Cleveland	36.00
Chicago	37.00

Prices of Raw Material

Ores	
	Per Gross Ton
Lake Superior Ores, Delivered Lower Lake Ports	
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40
Foreign Ore, c.i.f. Philadelphia or Baltimore	
	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	.8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	11c.
Iron ore, basic Swedish, average 65% iron	9c.
Manganese ore, washed 52% manganese, from the Caucasus	.26c. to .28c.
Manganese ore, Brazilian, African or Indian, basic 50%	.26c. to .28c.
Pungsten ore, high grade, per unit, in 60% concentrates	\$.12.00 to \$.13.00
	Per Gross Ton
Chrome ore, 45 to 50% Cr ₂ O ₃ crude, c.i.f. Atlantic seaboard	\$.22.00 to \$.24.00
	Per Lb.
Molybdenum ore, 85% concentrates of MoS ₃ , delivered	.50c. to .55c.

Coke	
	Per Net Ton
Furnace, f.o.b. Connellsville prompt	\$2.50 to \$2.60
Foundry, f.o.b. Connellsville prompt	3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal	
	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.25 to \$1.35
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, 1/4-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.35 to .55
Gas slack, f.o.b. W. Pa. mines	.90 to 1.00

Ferromanganese	
	Per Gross Ton
Domestic, 80%, seaboard	\$.94.00 to \$.99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen	
	Per Gross Ton Furnace
Domestic, 19 to 21%	\$30.00
Domestic, 16 to 19%	28.00

Electric Ferrosilicon	
Per Gross Ton Delivered	
50%	\$83.50
75%	130.00
Per Gross Ton Furnace	Per Gross Ton Furnace
10%	\$35.00
11%	37.00
	12%
	14 to 16%
	\$39.00
	39.00

Bessemer Ferrosilicon	
	Per Gross Ton
F.o.b. Jackson County, Ohio, Furnace	
10%	\$25.00
11%	26.00
12%	27.00

Silvery Iron	
	Per Gross Ton
F.o.b. Jackson County, Ohio, Furnace	
6%	\$21.00
7%	21.50
8%	22.00
9%	22.50
10%	23.00
11%	23.50
12%	24.00

Other Ferroalloys	
	Per Gross Ton
Ferrotungsten, per lb. contained metal del'd	\$1.30 to \$1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovandium, per lb. contained vanadium, f.o.b. furnace	\$.35 to \$.36
Ferrocobaltitium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	\$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	\$91.00
Ferrophosphorus, electric 24%, f.o.b. Aniston, Ala., per gross ton	\$122.50

Fluxes and Refractories	
	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	\$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	\$17.00 to \$17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick	
	Per 1000 f.o.b. Works
High-Heat	Intermediate
Duty Brick	Heavy Duty Brick
Pennsylvania	\$43.00 to \$46.00
Maryland	43.00 to 46.00
New Jersey	50.00 to 65.00
Ohio	43.00 to 46.00
Kentucky	43.00 to 46.00
Missouri	43.00 to 46.00
Illinois	43.00 to 46.00
Ground fire clay, per ton	7.00

Silica Brick	
	Per 1000 f.o.b. Works
Pennsylvania	\$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	\$8.50 to 10.00

Magnesite Brick	
	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick	
	Per Net Ton
Standard size	\$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts	
	Per Cent Off List
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	
Machine bolts	73
Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including 3/4 in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts	
	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh.	80, 10, 10 and 5
Stove bolts in packages, Chicago	80, 10, 10 and 5
Stove bolts in packages, Cleveland	80, 10, 10 and 5
Stove bolts in bulk, P'gh.	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Chicago	80, 10, 10, 5 and 2 1/2
Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2 1/2
Tire bolts	60, 10 and 10
Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.	

Large Rivets	
	Base per 100 Lb.
(1/2-in. and larger)	
F.o.b. Pittsburgh or Cleveland	\$2.75
F.o.b. Chicago	2.85

Small Rivets	
	Per Cent Off List
(3/8-in. and smaller)	
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws	
	Per Cent Off List
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	85 and 10
Upset hex. head cap screws, U.S.S. thread	85 and 10
Upset hex. cap screws, S.A.E. thread	80, 10 and 5
Upset set screws	80, 10 and 5
Milled studs	70

Founders Discuss Cost Work

Ohio Association Meeting Learns Also of Successful High-Phosphorus Castings

PROBLEMS of cost accounting and cost control were given prominence at a well attended annual meeting and fall regional conference of the Ohio Foundries Association, Inc., which was held at the Deshler-Wallick Hotel, Columbus, Nov. 13.

A. H. Kramer, Advance Foundry Co., Dayton, was elected president for the ensuing year, succeeding Don McDaniel, Hamilton. J. H. Bruce, Bowler Foundry Co., Cleveland, succeeded Mr. Kramer as vice-president. Charles Seelbach, Forest City-Walworth Run Foundry Co., Cleveland, was reelected treasurer.

Charles C. Erhart, Erhart Foundry & Machine Co., Cincinnati, was elected a new director for three years and the following directors were reelected: William Baker, Baker Bros., Inc., Toledo; Don McDaniel, Allen A. Nolte, Nolte Brass Foundry Co., Springfield, and C. C. Smith, Toledo Steel Casting Co., Toledo.

Identifies Expense Items by Numbers

A method of industrial accounting by production and operating factors was discussed by William A. Ullrich, certified public accountant, Dayton. He outlined and illustrated with charts the operation of this plan in the plant of the Dayton Steel Foundry Co. Under the plan the foundry is divided into three divisions with numerous subdivisions that are listed in the factory ledger. These include the service department, foundry and machine shop.

The service department includes such items as buildings, engineering, crane, air supply, plant maintenance and sand conditioning. There are 46 subdivisions in the three departments, each of which is designated by a number. On another form are listed the various items of expense, also designated by numbers. In keeping the cost records combined numbers of the department and activities charged against that department are used.

For example, in an item listed as 26-14 the former figure shows the subdivision against which the charge is made and the latter the specific activity charged to the subdivision. The system involves the carrying of approximately 275 accounts in the ledger. Various other charts were shown illustrating the method of keeping records of raw materials, direct and indirect labor, direct and indirect payroll, distribution of burden and various other details of the system.

An outstanding feature of the plan is that a separate accounting is kept for each manufacturing department and the speaker pointed out that a bird's-eye view is provided continuously of the cost of each department. If

there should be a cost fluctuation in a department, the records would show this at a glance. Among advantages claimed for the system are that there is a cost control of each activity; correct distribution of overhead; from the records it can be determined whether the department is efficient or inefficient; it is an aid to more accurate budgeting and to the elimination of waste and an assistance in bringing about production economies. The speaker stated that the expense of operating the system was no more than that of an ordinary cost system.

Uniform Plant Valuation Needed

The desirability of a uniform system of plant valuation was urged by Frank W. Jackson, vice-president, American Appraisal Co., Chicago. He pointed out that in recent years investments in plants have increased more rapidly than the increase in production and declared that property assets are now being appraised with as much accuracy as other assets. The speaker favored adoption of a uniform system of cost finding and the intelligent use of depreciation so that, with an accurate appraisal of plant and equipment, competitive manufacturers would have a uniform basis for competition. Asked if he would lower the basis of depreciation during periods of depression, the speaker answered in the negative. He said that depreciation should be based on normal operation and that obsolescence is a greater factor in depreciation than wear and tear and that obsolescence goes on whether plant equipment is idle or operating.

High-Phosphorus Castings

The use of pig iron of a relative high phosphorus content in the production of a general line of castings was declared practical by Y. A. Dyer, metallurgist, Birmingham, who presented a paper on "Phosphorus in Cast Iron." He gave the results of various tests that tended to substantiate his claims. Following his paper Mr. Dyer referred to tests that he had made to show that strong, tough iron can be produced by keeping the carbon content down and not decreasing the phosphorus. These were made in a twin type cupola, the coke being burned in an auxiliary chamber and the iron melted in the primary chamber at a low bed so that less carbon would be picked up. The total carbon was brought down to 3.08 per cent while the phosphorus was kept up to 0.80 per cent. Test bars showed a tensile strength of 42,000 to 46,000 lb. per sq. in. and a Brinell hardness not to exceed 205.

A series of motion pictures of the production of pig iron in the blast furnaces of the American Rolling Mill

Co. were shown by Ralph H. Sweetser, assistant to the vice-chairman of that company, who accompanied the pictures with a brief talk.

Maintains Credit Ratings

Some of the work that is being accomplished by the association and plans for the coming year were outlined by Robert Hoierman, secretary. He announced that the association is now establishing a central control system for checking customers' credits in order to prevent credit losses that result either from slow payment or nonpayment of bills. Members will report to the association when customers' accounts are long past due.

A traffic service is being inaugurated to check freight bills and render other service in connection with freight rates. The trade customs of the association have been approved by a committee of the National Association of Purchasing Agents and Mr. Hoierman said he expected that that association shortly would approve the committee's report. An all-year-round safety campaign has been planned with a view to reducing foundry accidents and thus bringing about lower State insurance rates. Mr. Hoierman urged the holding of group and sectional conferences of foundrymen as a means of eliminating evils of the foundry industry.

Baltimore & Ohio Awards Contracts for \$505,000

BALTIMORE, Nov. 18.—The T. J. Foley Co., Pittsburgh, has been awarded two contracts on two different sections and the Empire Construction Co., Baltimore, has been awarded a contract on a third section in connection with the construction for the Baltimore & Ohio Railroad of second track, revision of main track and extension of passing sidings between Hayes Borough and West Alexander, Pa., a distance of 48 miles. The work calls for an immediate expenditure of \$505,000. The Baltimore & Ohio also is about to proceed with the installation of automatic signals from Glenwood Junction, Pa., to Gilkeson, Pa., and insertion of centralized train control from Gilkeson to Wheeling at an estimated cost of \$680,000.

A. O. Smith Corpn. Gets 145-Mile Pipe Order

The A. O. Smith Corpn., Milwaukee, announced Nov. 13 receipt of an order for 145 miles of large diameter pipe for a natural gas line in Louisiana for the Texas Construction Co., subsidiary of the Electric Bond & Share Corpn. Production will be started at once, early shipment being specified. In recent weeks one pipe mill of the Smith corporation has been operating while the second mill was shut down. The new order will call the second mill back into operation and several hundred workmen will be reemployed immediately.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Higher and Active— Tin Dull—Lead Steady —Zinc Weak

NEW YORK, Nov. 18.

Copper

Following the announcement the middle of last week that an agreement had been reached among the American, Canadian and African producers of copper to curtail world output about 20,000 tons a month, copper prices rapidly advanced. On Nov. 12 electrolytic copper was quoted at 10c., delivered in the Connecticut Valley, an increase of ½c. over the low price which had prevailed for several weeks. On Nov. 13 quotations went to 11c. and on Nov. 14 to 12c.

These rapid advances have resulted in a chaotic market condition. When the 12c. level was reached, accompanied at the same time by the announcement of a price of 12.30c., c.i.f. usual European ports, by Copper Exporters, Inc., buying both here and abroad virtually stopped. It had been very heavy up to that time, sales to foreign consumers on one day, Saturday, Nov. 15, amounting to nearly 9000 gross tons. The total foreign sales to date are now about 68,000 tons, or equal to the October total. Last week on the advancing market about 66,000 tons was sold to domestic consumers.

Today, in the absence of practically any demand and with foreign sales less than 400 tons, electrolytic copper is quoted by most producers nominally at 12c., delivered in the Connecticut Valley. One custom smelter, however, today announced a price of 11c., at which it would take business and this we quote as the present market. Lake producers, which sold some metal on the way up, are quoting 12c. to 12.12½c., delivered.

It is quite generally admitted by leading producers that the advance has been too rapid and that a mistake has been made. Higher prices than 10.30c. or 11c. were vigorously protested by some interests. Various explanations are offered as to the cause of the advances. It is stated that they were considered justified in some quarters to compensate for the increased cost due to curtailment. Another statement is that one or two producers independently advanced the price and others followed. It is generally recognized, however, that the advance is a benefit to the copper industry and to industry in general, the movement having had a stimulating effect on tin and on some other commodities. It seems probable that the 12c. level will not hold, as very little metal changed hands at that

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Nov. 18	Nov. 17	Nov. 15	Nov. 14	Nov. 13	Nov. 12
Lake copper, New York.....	12.12½	12.12½	12.12½	12.12½	11.12½	10.12½
Electrolytic copper, N. Y.*.....	10.75	11.75	11.75	11.75	10.75	9.75
Straits tin, spot, N. Y.	25.75	26.00	.....	26.75	26.37½	25.37½
Zinc, East St. Louis.....	4.32½	4.32½	4.32½	4.35	4.37½	4.37½
Zinc, New York.....	4.67½	4.67½	4.67½	4.70	4.72½	4.72½
Lead, East St. Louis.....	4.95	4.95	4.95	4.95	4.95	4.95
Lead, New York.....	5.10	5.10	5.10	5.10	5.10	5.10

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

price, and that the market will settle to a somewhat lower level.

Tin

Prices for spot Straits tin have advanced, and on one day, Nov. 12, 500 to 600 tons changed hands, consumers and dealers participating. This activity is ascribed to the advance on that day in the price of copper, the market having closed strong with sales at from 25.12½c. to 25.50c. and with more buyers than sellers. All the business was done late in the afternoon. Since then the market has drifted and has been a quiet affair. Yesterday it was weak at the close, with quotations ranging from 26.37½c. down to 25.87½c., with a general desire to sell, but with very few buyers. Today, in a dull market, spot Straits tin was quoted at 25.75c., New York, a decline of about 1c. a lb.

from the highest price during the week. London prices today were about £2 a ton higher than a week ago, with spot standard quoted at £113 5s., future standard, £114 10s., and spot Straits, at £117 15s. The Singapore price today was £118 15s. Stocks in British warehouses on Saturday, Nov. 15, totaled 22,491 tons, a decline of 844 tons for the week.

Lead

Buying by practically all leading consumers of lead was heavy during the week up to yesterday, when the market turned quiet. Most of the sales were for December delivery. Prices are firm and unchanged at 4.95c., St. Louis, or 5.10c., New York, which is the contract quotation of the leading interest. A decline today in the London market is the cause of dullness here. Stocks of lead in-

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	16.50c.
Copper, hot rolled, base sizes.....	19.50c.
Copper, cold rolled, 14 oz. and heavier, base sizes.....	21.50c.
Seamless Tubes—	
Brass	21.50c.
Copper	21.75c.
Brass Rods	14.87½c.
Brass Tubes.....	24.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open.....	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	27.75c. to 28.75c.
Tin, bar	29.75c. to 30.75c.
Copper, Lake	13.00c.
Copper, electrolytic	12.75c.
Copper, casting	12.50c.
Zinc, slab.....	5.75c. to 6.75c.
Lead, American pig.....	6.00c. to 7.00c.
Lead, bar	8.00c. to 9.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 Ingots for remelting (guaranteed over 99% pure).....	24.00c. to 25.00c.
Alum. Ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½.....	19.00c. to 20.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig.....	30.50c.
Tin, bar	32.50c.
Copper, Lake	13.13c.
Copper, electrolytic	13.13c.
Copper, casting	12.75c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig.....	5.75c. to 6.00c.
Lead, bar	8.50c.
Antimony, Asiatic	11.50c.
Babbitt metal, medium grade.....	15.25c.
Babbitt metal, high grade.....	35.00c.
Solder, ½ and ½.....	19.75c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses. (Because of the uncertain market, prices quoted are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	9.00c.	10.25c.
Copper, hvy. and wire	8.75c.	9.75c.
Copper, light and bottoms	7.75c.	8.75c.
Brass, heavy	5.50c.	6.50c.
Brass, light	4.50c.	5.50c.
Hvy. machine composition	8.00c.	9.00c.
No. 1 yel. brass turnings	5.75c.	6.50c.
No. 1 red brass or compos. turnings..	7.50c.	8.50c.
Lead, heavy	4.00c.	4.50c.
Lead, tea	2.50c.	3.00c.
Zinc	2.25c.	2.75c.
Sheet aluminum.....	7.50c.	9.50c.
Cast aluminum.....	6.00c.	8.00c.

creased about 11,000 tons during October, and producing companies in southeastern Missouri announce that they curtailed output about 20 per cent, beginning Nov. 1.

Zinc

With demand very light, prices have softened again and prime Western zinc is quoted at 4.32½c., East St. Louis, or 4.67½c., New York. Ore is unchanged at \$26 a ton, Joplin. Shipments last week were about 7465 tons with production about 8000 tons, making the surplus 42,035 tons, another high for the year.

Antimony

In a dull market, Chinese metal is quoted at 7.12½c., duty paid, for spot, with futures at 7c. to 7.05c.

Nickel

Long-established prices are unchanged, with wholesale lots of ingot nickel at 35c. a lb., shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum

Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Nov. 18.—Prices for tin and zinc have followed the lead of copper to higher levels. Sales remain in steady volume while inquiries are more brisk. The old metal market is gaining in activity.

Prices per lb. in carload lots: Lake copper, 12.12½c.; tin, 26.87½c.; lead, 5.05c.; zinc, 4.45c.; in less-than-carload lots, antimony, 8.37½c. On old metals we quote copper wire, crucible shapes and copper clips, 8c.; copper bottoms, 7c. to 7.50c.; red brass, 7c. to 7.50c.; yellow brass, 5c. to 5.50c.; lead pipe, 3.75c. to 4c.; zinc, 1.50c. to 1.75c.; pewter, No. 1, 15c.; tin-foil, 16c.; block tin, 22c.; aluminum, 6.50c. to 7c.; all being dealers' prices for less-than-carload lots.

Railroad Equipment

Standard Oil Co. of New Jersey is inquiring for six tank cars.

Virginian Railway is in the market for 10 locomotive tenders.

Neville Chemical Co., Pittsburgh, is inquiring for five tank cars.

International Harvester Will Lend to Unemployed

The International Harvester Co., Chicago, has announced a plan to tide over its regular employees through the depression period by means of loans. Loans will be made without interest to those who have been or may be laid off and are expecting to return later to the six plants of the company in the United States and Canada. These loans may be paid off in small instalments after the employees have resumed work.

Fabricated Structural Steel

Total of 45,000 Tons in New Projects—About 28,000 Tons of Awards Includes 15,000 Tons of Oil Tanks

NEW projects requiring fabricated steel total about 45,000 tons this week, which is smaller than in the three previous weeks, but well up among the larger totals for the year. The more important tonnages include a building for the Olympic Club, San Francisco, 7500 tons, highway bridges in Tennessee, 7000 tons, a warehouse in Honolulu for the Hawaiian Pineapple Co., 4000 tons, a viaduct on Market Street, West Philadelphia, for the Pennsylvania Railroad, 3000 tons, and a graduate school at Yale University, New Haven, Conn., 2000 tons.

Awards of 28,000 tons include 15,000 tons in oil tanks for the Continental Oil Co. Transmission towers at Bagnell, Mo., awarded by the Union Electric Light & Power Co., require 4160 tons of structural steel. Awards follow:

North Atlantic States

FALL RIVER, MASS., 130 tons, city water tank, to Chicago Bridge Co.

NEW YORK, 700 tons, apartment building, 414 East Fifty-second Street, to Easton Structural Steel Co.

NEW YORK, 600 tons, Medical Chambers building, 140 East Fifty-fifth Street, to Lehigh Structural Steel Co.

PLATTSBURG, N. Y., 500 tons, normal school, to Williams Bridge Co., Syracuse.

READING RAILROAD, 185 tons, plate girder bridges on Shamokin division, to Bethlehem Steel Co.

The South

BIRMINGHAM, 250 tons, Woodward Iron Co. pig iron casting shed, to Ingalls Iron Works.

Central States

LANSING, IOWA, 1400 tons, highway bridge, to McClintic-Marshall Co.

CHICAGO, 600 tons, Union Avenue and Peoria Street viaducts for Chicago & North Western, tonnage divided between Mississippi Valley Structural Steel Co. and Worden-Allen Co.

CHICAGO, 2420 tons, Wendell Phillips High School, to New City Iron Co.

HAMILTON, OHIO, 125 tons, Second National Bank building, to Wheeling Structural Steel Co.

BAGNELL, Mo., 4160 tons, transmission towers for Union Electric Light & Power Co., to McClintic-Marshall Co.

Western States

SAPULPA, OKLA., 15,000 tons, tank work for Continental Oil Co., to Chicago Bridge & Iron Works.

SAN FRANCISCO, 250 tons, plates, tug boat for Young Brothers, Ltd., Honolulu, to Bethlehem Shipbuilding Corp.

BERKELEY, CAL., 600 tons, engineering building, University of California, to Pacific Coast Engineering Co.

SPOKANE, WASH., 266 tons, addition Inland Empire Paper Co. plant, to Austin Co.

ROCK ISLAND, WASH., 550 tons, power house, to an unnamed bidder.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

ARLINGTON, MASS., 438 tons, high school.

AUGUSTA, ME., 140 tons, bank alterations.

NEW LONDON, CONN., 130 tons, Coast Guard unit.

GLENS FALLS, N. Y., 100 tons, theater.

NEW HAVEN, CONN., 2000 tons, graduate school for Yale University; Mark Eidletz, contractor.

NEW YORK, 800 tons, building in the Bronx for Board of Transportation.

NEW YORK, 1700 tons, apartment building, 850 Fifth Avenue.

AUBURN, N. Y., 1000 tons, buildings for State prison.

STATE OF NEW YORK, 1000 tons, highway bridges at Enfield Glen, St. Johnsville and Spring Valley; bids close Nov. 18.

NEW YORK, 700 tons, apartment building on West Twelfth Street.

NEW YORK, 800 tons, apartment building on East Twenty-eighth Street.

NEW YORK, 600 tons, Theodore Roosevelt Memorial Hall, Central Park West and Seventy-seventh Street.

LONG ISLAND CITY, N. Y., 500 tons, shop building for Crane Co.

HUNTINGTON, N. Y., unstated tonnage, club house for Crescent Athletic Club.

PORT CHESTER, N. Y., 200 tons, high school.

PENNSYLVANIA RAILROAD, 3000 tons, viaduct on Market Street, West Philadelphia.

The South

STATE OF TENNESSEE, 6000 to 7000 tons, highway bridges.

BIRMINGHAM, ALA., 400 tons, street and railroad underpass.

Central States

TOLEDO, OHIO, 400 tons, channels and steel piling for Lucas County.

MILWAUKEE ROAD, 1000 tons, bridges.

CHICAGO, 2000 tons, Wells public school.

CHICAGO, 2000 tons, South Park Board's portion of Randolph Street viaduct.

MOUNT CARMEL, ILL., 2700 tons, highway bridge.

Western States

MARE ISLAND, CAL., 3000 tons, plates for a cruiser; bids opened in Washington.

SAN DIEGO, CAL., 521 tons, First Street bridge; bids Dec. 1.

SAN FRANCISCO, 7500 tons, Olympic Club; bids Nov. 17.

SAN FRANCISCO, 300 tons, bridge girders for Western Pacific Co.; bids opened.

SACRAMENTO, CAL., 787 tons, Polga River bridge; bids Dec. 3.

HONOLULU, 4000 tons, warehouse for Hawaiian Pineapple Co.; bids rejected and building will be redesigned.

COQUILLE, ORE., 271 tons, bridge over Isthmus inlet; bids Dec. 8.

Automobile Companies Making New Models Increase Output

DETROIT, Nov. 17.

EXPANDING operations of automobile companies making new models were responsible for a slight upturn in output the past week. Although the Chevrolet Motor Car Co. had a public showing of its 1931 cars in Detroit the last seven days, the first national announcement did not occur until Saturday. It probably will be at least a month before the public response to the new car can be determined. Meanwhile, the Chevrolet people are confident of success, and November-December output is expected to be from 90,000 to 100,000 units. It is reported that the company has tentatively scheduled 75,000 cars for January, with the hope that the public's acceptance of the new models will be sufficiently popular to step up production to that basis before Jan. 1.

In the past it has been Chevrolet's practice to start assemblies of a new car at a comparatively low rate and then progressively increase production each month until a peak for the year is reached. Unless business should decline to lower levels, it is believed that the Chevrolet company will be able to carry through this expansion program as in past years.

Ford 1930 Output 1,500,000 Cars

WORLD production of the Ford Motor Co. in October was over 78,000 units, a decrease of 19,000 units from the previous month's total. Ford's output for 1930 probably will be around 1,500,000 cars, compared with 1,950,000 in 1929. In view of the fact that total automobile production for the United States and Canada this year will be in the neighborhood of 3,500,000 cars, this means that the Ford company will build about 43 per cent of all cars manufactured, which is a relatively better showing than in the previous year.

Ford's operations at the Rouge plant have continued on a three-day-a-week schedule, but output this month probably will drop considerably from the October level. It is said that the December rate will represent a still further decline. Ford has bought little steel for two months and it is considered likely that its own steel mills will be down during the greater part of December.

Hudson-Essex Producing 1931 Models

THE new Hudson and Essex models will be announced just as soon as dealers can be supplied with an adequate number of samples. The Hud-

son Motor Car Co. is now employing about 7500 men, and is reported to have a production schedule calling for 40,000 cars during the remainder of the year. Contrary to expectations, it is now believed that no radical change will be made in the body design of either the Hudson or the Essex. In line with the movement of the entire industry to give the buyer more car for his money, both makes will be somewhat larger and heavier, with considerable attention directed toward many minor refinements. It is these refinements which automobile salesmen have found to be the best selling points in the past year. Following the example set by other cars, the new Hudson probably will have a metal screen grid across the radiator. The company's policy in regard to prices has been closely guarded, but observers think it a certainty that substantial reductions will be made. Almost every automobile manufacturer who has offered a new car in recent months has established price schedules below those which prevailed a year ago, and the Hudson company is not expected to be an exception.

With exception of last two weeks of December, automobile output probably will not again reach low point of October.

* * *

Chevrolet to assemble 90,000 to 100,000 units in November and December and Hudson-Essex 40,000.

* * *

Ford production for year expected to be about 1,500,000 cars contrasted with 1,950,000 in 1929. This represents 43 per cent of entire output, a relatively better showing than last year.

* * *

Greater use of chromium plating noted in 1931 models.

son Motor Car Co. is now employing about 7500 men, and is reported to have a production schedule calling for 40,000 cars during the remainder of the year. Contrary to expectations, it is now believed that no radical change will be made in the body design of either the Hudson or the Essex. In line with the movement of the entire industry to give the buyer more car for his money, both makes will be somewhat larger and heavier, with considerable attention directed toward many minor refinements. It is these refinements which automobile salesmen have found to be the best selling points in the past year. Following the example set by other cars, the new Hudson probably will have a metal screen grid across the radiator. The company's policy in regard to prices has been closely guarded, but observers think it a certainty that substantial reductions will be made. Almost every automobile manufacturer who has offered a new car in recent months has established price schedules below those which prevailed a year ago, and the Hudson company is not expected to be an exception.

THE action of the Chrysler Corp. in reducing its quarterly dividend from 75c. to 25c. is regarded as significant, but not surprising. Aside from the Chrysler Imperial series, Chrysler-made cars have been selling poorly. New Dodge and De Soto models are expected shortly, but announcement has been made that the Plymouth models to be displayed at the January show will not represent a change from the present design. Meanwhile, Chrysler production continues at an unsatisfactory rate. For the first 10 months of 1930, Chrysler shipments declined 40 per cent from the corresponding period of last year.

With the exception of the last two weeks of December, when activities will be interrupted for the holidays and inventory purposes, automobile output probably will not again reach the low mark which prevailed during October. Although Ford may show another decrease this month, increased production by Chevrolet, Hudson and other makers will more than offset this loss.

Chromium Plating Used More Extensively

THE extensive use of rustless steel by the Ford Motor Co. and the consideration given to this material by other automobile companies were interpreted in certain quarters as the beginning of a permanent decline of the popularity of chromium plating. However, it is significant that the 1931 cars which have already been announced, especially the Chevrolet, have been made smarter looking largely through the wider application of chromium plating. It is said that Ford, on account of its tremendous production, has been able to keep the cost of rustless steel on a basis comparable with that of chromium plating, but no other maker feels that it can duplicate these results. Consequently, unless the price of rustless steel is materially reduced, it probably will be a long time before chromium plating is displaced in appreciable volume.

IN an effort to regain automobile freight which has been lost recently to waterways and motor trucks, 23 traffic vice-presidents of railroads operating east of Chicago met with a

committee of traffic managers of automobile companies, under the auspices of the National Automobile Chamber of Commerce, in Detroit the past week. For some time carriers have been studying losses due to truck-away methods employed by automobile companies for delivering cars from factories to distributors and dealers, and it is understood that they hope to regain some of this business through a reduction in rates. J. S. Marvin of the National Automobile Chamber of Commerce pointed out at the meeting that in 1929 2,390,000 cars and trucks had been delivered in the territory east of Chicago, of which 890,000 were moved by rail. The remainder, amounting to 1,500,000 units, were transported by waterways and highways. Discussion of ways and means of increasing delivery of cars by railroad will be continued at a meeting in Detroit on Dec. 10.

Overhead Expenses Cut

ALTHOUGH Chevrolet has revised its prices downward, the story is that the company has effected manufacturing economies which will give it the same profit per car as in 1930, provided that it can maintain its sales at a correspondingly good level. It is said that other automobile makers have learned a lesson from the situation which faced them this year and are preparing to go into 1931 on the basis of earning moderate profits on a reduced volume of business. The savings which make this possible are not confined to the production departments, however, for they extend into all operations. This brings to mind the case of one large company in the Detroit district which cut \$200,000 of overhead from its sales department this year without seriously impairing the efficiency of its selling organization.

275-Ton Ladle Crane Installed by Republic

A ladle crane of 275-ton capacity, said to be the largest ever built, was placed in operation during the week by the Republic Steel Corp. in its open-hearth plant in Youngstown. Two additional cranes of the same size will be erected shortly. The capacity of the open-hearth furnaces has been increased from 85 tons to 120 tons, and it is stated that a later expansion to 250-ton capacity is contemplated. In a test of the new crane a lift of 343 tons was made.

A Southern chapter of the Institute of Scrap Iron and Steel, Inc., was organized at Atlanta, Ga., on Nov. 11. This is the fourteenth chapter of the institute and covers the territory below the Mason-Dixon line to the State of Texas. W. M. Smith of W. M. Smith & Co., Birmingham, was elected temporary president, with J. B. Knight of J. T. Knight & Son, Inc., Columbus, Ga., vice-president.

Reinforcing Steel

Awards of 6800 Tons—Inquiries Still Light

LETTINGS of reinforcing steel the past week were in larger volume, totaling 6800 tons compared with 3800 tons the previous week. An apartment building in Washington will take 2500 tons. New business was again light and calls for only 3100 tons, with no job of outstanding size. Awards follow:

NEW YORK, 500 tons, Paramount Publix Corp. warehouse in mid-Manhattan, to Turner Construction Co.

PLAINFIELD, N. J., 300 tons, sewer, to Igoe Brothers.

ALBANY, N. Y., 150 tons, theater, to Joseph T. Ryerson & Son.

SCHENECTADY, N. Y., 150 tons, theater, to Joseph T. Ryerson & Son.

QUANTICO, VA., 850 tons, barracks for United States Marine Corps, to Dietrich Brothers.

WASHINGTON, 150 tons, building for Howard University, to an unnamed bidder.

WASHINGTON, 2500 tons, Kennedy-Warren apartment building, to Rosslyn Steel & Cement Co., Rosslyn, Va.

MILWAUKEE, 250 tons, school, to Olney J. Dean & Co.

DAVENPORT, IOWA, 200 tons, theater and office building, to Joseph T. Ryerson & Son.

GARY, IND., 200 tons, school, to Kalman Steel Co.

DUBUQUE, IOWA, 100 tons, Masonic Temple, to Concrete Steel Co.

CHICAGO, 100 tons, Fish furniture store, to Joseph T. Ryerson & Son.

CHICAGO, 100 tons, theater on Sixty-third Street, to Concrete Engineering Co.

CLAYTON, MO., 400 tons, pumping station and reservoir for St. Louis County Waterworks Co., to Laclede Steel Co.

LOS ANGELES, 350 tons, apartment building, Sunset Boulevard, to an unnamed bidder.

STOCKTON, CAL., 268 tons, County hospital, to W. C. Hauck Co.

SPOKANE, WASH., 231 tons, Inland Empire Paper Co. plant addition, to Pacific Coast Steel Corp.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEWPORT, R. I., 300 tons, naval academy.

LONG ISLAND CITY, N. Y., 700 tons, warehouse for Crane Co., Chicago; general contract bids taken Nov. 18.

BROOKLYN, 100 tons, Harway Avenue bridge.

BROOKLYN, 450 tons, subway route 107, section 8; revised general contract bids to be taken Nov. 25.

BRENTWOOD, N. Y., 190 tons, tunnel for Pilgrim Hospital; general contract bids taken.

AUBURN, N. Y., 500 tons, State prison building.

DANNEMORA, N. Y., unstated tonnage, State prison building.

WASHINGTON, 400 tons, Theodore Roosevelt High School; National Construction Co., Atlanta, Ga., low bidder on general contract.

CHICAGO, 160 tons, Lutheran school.

CHICAGO, tonnage being estimated, Moody Bible Institute.

MILWAUKEE, tonnage being figured, several public schools.

CHICAGO, 300 tons, contract No. 3 for sewer in sanitary district.
ST. LOUIS, 300 tons, merchandise mart.
STATE OF INDIANA, 200 tons, paving; bids to be opened Nov. 21.
COQUILLE, ORE., 400 tons, bridge over Isthmus Inlet in Bunker Hill; bids Dec. 8.

Predicts Continued Large Demand for Line Pipe

As the result of a survey of oil, gas and gasoline pipe lines, Arthur G. McKee & Co., engineers, Cleveland, state that the pipe-making division of the steel industry is promised a probable demand for 15,000,000 to 20,000,000 tons of line pipe in the next three to five years. A summary of the McKee survey contains the following:

"Until 1927 a line for transmission of gas more than 250 miles was considered an engineering phenomenon, while at present lines up to 1200 miles are under construction. This has been made possible by the development of electrically welded steel pipe and seamless pipe which will withstand high pressures and which have largely replaced screwed lapweld pipe.

"Four electrical welding processes have been developed, including the arc weld of the A. O. Smith Corp., Milwaukee; electric resistance weld of the Republic Steel Corp., Youngstown; induction weld of the Youngstown Sheet & Tube Co., Youngstown, and arc weld of the National Tube Co., Pittsburgh.

"The annual capacity of the Smith corporation is estimated at 1,500,000 tons, and that of the Republic Steel Corp. is 420,000 tons, while the other two producers still are developing their production units. The value of the new electric welded pipe lies in greater strength for the same weight and absence of weld weakness, longer lengths and consequent cheaper laying costs.

"Present potential pipemaking capacity in the United States is nearly 8,000,000 tons, divided as follows: Lapweld, 2,900,000 tons; butt weld, 932,000 tons; seamless, 1,735,000 tons; electric weld, 2,200,000 tons. Electrically welded pipe has moved from practically nothing to second place in the last three years. In that time lapweld pipe has not increased its production.

"Electrically welded pipe 16 in. in diameter, to withstand 800 lb. per sq. in. pressure, weighs 157 tons per mile less than lapweld, a saving of about \$11,000 per mile for cost of pipe and \$2,000 per mile for freight charges."

Follansbee Brothers Co., Pittsburgh, has discontinued its Indianapolis warehouse and has turned its stock of sheets over to the Thomas & Skinner Steel Products Co., which will be the jobber for Follansbee products in Indianapolis. E. C. Folkening, who has been with Follansbee for more than 25 years, will continue as district sales manager, with headquarters in Indianapolis.

Date of Upturn Is Still Uncertain

BY LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

STEEL production in October fell off sharply; at 64.2 per cent of estimated normal, it compared with 72.7 in September. Unfilled orders of the Steel Corporation made less than the usual gain and, at 80 per cent of the 1923-1927 average, compared with 80.8 per cent on Sept. 30. This is the lowest, considering the season, since December, 1927. The average price of finished steel was lower in October than in September, being 84.6 per cent of the 1923-1927 average, against 85.1 per cent.

Pig iron production fell to 72.1 per cent of estimated normal, compared with 77.8 in September. The average price of pig iron during the month was 76.3 per cent of the 1923-1927 average, against 77.8 in the preceding month.

Will there be an upturn in January? First, let us look at precedent. It is normal for production to show *seasonal* gains between December and March. There were *cyclical* upturns in iron and steel production early in the years 1904, 1908, 1911 and 1915. Except in 1915, however (war conditions), these upturns were short-lived, being followed by reactions. And in 1921, 1924 and 1928 the recoveries in the steel cycle began before January. Thus in several pre-war cycles, when an upturn in production came at the beginning of a year, it was followed by relapse. In post-war cycles, the upturns have not come at the beginning of the year.

The most important question concerns the outlook for general business. Anyone who is convinced that railroads, builders, and automobile manufacturers will increase their purchases of steel *more than*

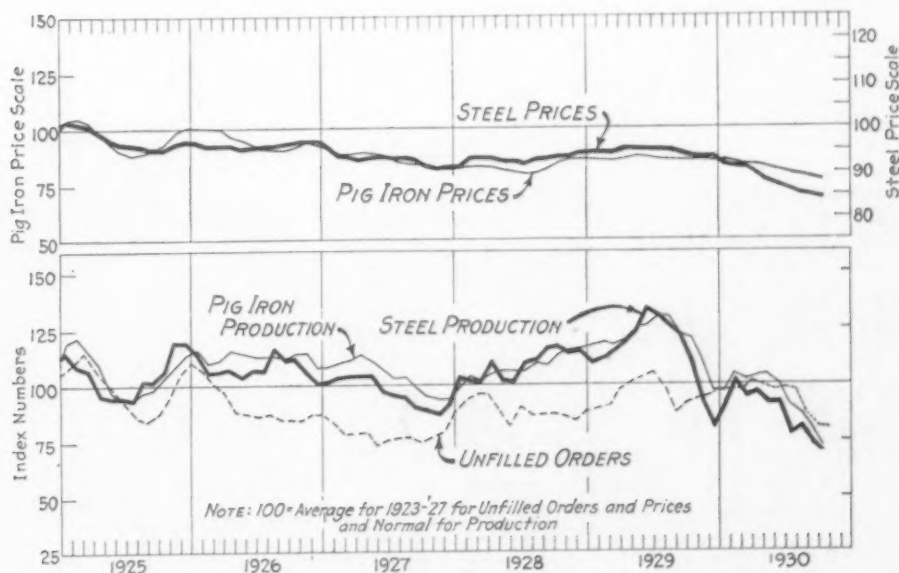
seasonally, with the beginning of 1931, will agree that expansion in steel only awaits the turn of the year.

Steel production is still considerably higher with relation to "normal" than is customary at the bottom of major recessions. Pig iron production and steel production, at the bottom of a cycle, usually become adjusted at about the same percentages of their respective normal trends, and the ratio of pig iron to steel usually falls considerably lower than now. Bond and stock markets usually have clearly begun a sustained upward trend before the steel industry expands. These facts, the decline in scrap, and the present below-normal position of the author's P-V (price to volume) line make it wise to suspend judgment concerning a January rise in the steel industry.

In November, 1927, effective stabilization of prices came exactly at the bottom of a business cycle; commodity prices had been rising for four or five months, finished steel was relatively cheap compared with the general price level, and unfilled orders of the Steel Corporation had been gaining for two or three months.

During the past year the world has seen the most persistent and wide-spread efforts ever made to combat business recession. Can anyone say that these efforts have helped? The writer inclines to the opinion that, once more, the date has been set a little too close, although this time the ultimate turn is obviously not so remote.

Steel and pig iron production both dropped sharply and prices for both are lower. While the upturn is obviously nearer, it is not likely to come in January.



▲ ▲ ▲ OBITUARY ▲ ▲ ▲

DR. RICHARD MOLDENKE died Nov. 17 following a surgical operation in a Plainfield, N. J., hospital. In his passing the castings industry has lost its great technician and its generous adviser. Foundrymen here and abroad, particularly in Germany, Great Britain and France, share in this loss, for he was in active touch with developments in several countries through visits to foundry centers and conventions in the United States and Europe. He was a pioneer in the gray iron industry in lifting practice from the empirical to the scientific. He was one of the founders of the organization that ultimately became the American Foundrymen's Association, which he served for 15 years as secretary and treasurer. As a consulting metallurgist, his counsel and advice were given often freely and his contributions to the technical literature of the foundry were numerous and outstanding. THE IRON AGE particularly will miss his ever friendly helpfulness.

Dr. Moldenke was born in Watertown, Wis., on Nov. 1, 1864, and was a son of the late Rev. Dr. and Mrs. Edward F. Moldenke. His family moved from Wisconsin to New York in 1870 and his father for many years was pastor of St. Peter's Lutheran Church in New York, where one of his two brothers, is at present pastor. He was graduated from the School of Mines, Columbia University in 1884 and after two years in commercial metallurgy, he became an instructor there, where he remained until 1887 when he received his Ph.D. degree.

In 1889 he organized the mechanical and engineering departments of the Michigan College of Mines. In 1890 he became associated with the foundry industry, doing research work for a number of companies, and in 1900 he designed and directed the construction of the Pittsburgh plant of the Pennsylvania Malleable Iron

Co. In the Roosevelt administration he was appointed by the President to investigate the mines of the country with a view to the development of safety devices. During the World War he supervised the casting of war material and made specifications for the castings used in the manufacture of the Liberty motors for airplanes for Canadian and American munitions manufacturers.

Among books of which Dr. Moldenke was the author, his "Principles of Iron Founding" and "Production of Malleable Castings" are most prominent. In 1925 he was awarded the Joseph C. Seaman gold medal by the American Foundrymen's Association. He was a member of a number of technical societies and clubs.

He is survived by a widow, two sons, Richard, Jr., of Watchung and Edsel of Nova Scotia; a daughter, and two brothers.

HENRY HARNISCHFEGER, president of the Harnischfeger Corp., Milwaukee, died suddenly on Nov. 15 from a heart attack at his home while preparing to go to his office. Mr. Harnischfeger was born 75 years ago in Germany and came to America as a boy of 16, after completing an apprenticeship to a locksmith. For nearly ten years he was a toolmaker of the Singer Mfg. Co., at Elizabeth, N. J., going to Milwaukee in 1881 to become foreman of the milling machine department of the Whitehill Sewing Machine Co. Here he met the late Alonzo Pawling, with whom he formed a partnership to engage in the general jobbing machine industry.

In 1887 the Edward P. Allis Co., now the Allis-Chalmers Mfg. Co., placed A. J. Shaw in charge of rebuilding one of the rope-driven traveling cranes in its plant. He revolutionized the whole method of traveling crane design by replacing the rope

mechanism with electric motors, giving this work to Pawling & Harnischfeger. At the same time a contract was placed for three new electric cranes. These proved to be so successful that Messrs. Shaw, Pawling and Harnischfeger organized the Shaw Electric Crane Co. When Mr. Shaw retired several years later, the firm took the name of Pawling & Harnischfeger Co. Mr. Pawling retired in 1911 and disposed of his interests to Mr. Harnischfeger. In 1924 the corporate title was changed to Harnischfeger Corp., although the familiar "P. & H." trade-mark has always been continued in use.

Mr. Harnischfeger made a trip around the world several years ago and this year spent several months in Europe. At Salsmuenster, Germany, his birthplace, he laid the cornerstone of a new school made possible by his gifts. Before departing on this trip, Mr. Harnischfeger set aside securities and cash for a foundation fund dedicated to the welfare of his employees. It was hoped that the fund would reach \$1,000,000 in five years.

Two weeks ago he wrote to THE IRON AGE congratulating it on "its completion of 75 years of service to the metal trades industry," saying also: "I have read THE IRON AGE for many years and in fact it is one of very few magazines that I find time to read today. We have also advertised in it rather continuously ever since building cranes."

JOHN E. PERRY, until his retirement early in 1929 chairman of the board of the Valley Mold & Iron Corp., Hubbard, Ohio, died suddenly in Youngstown Nov. 12. He was born in Athens County, Ohio, 52 years ago, and began his business career in the Hocking Valley coal industry. Later he was identified for a time with the Republic Iron & Steel Co., Youngstown, and subsequently served as president of the old Wharton Steel Co., Wharton, N. J., which operated blast furnaces and extensive mining



Dr. Richard Moldenke



Henry Harnischfeger



John E. Perry



Edward C. Waldvogel

developments in New Jersey and eastern Pennsylvania. He went with the Valley Mold company shortly after the war, and served as president for a number of years prior to his election as chairman of the board. Mr. Perry was widely known in the iron and steel industry, and had been prominent in the affairs of the American Institute of Mining and Metallurgical Engineers and the American Iron and Steel Institute.

EDWARD CONRAD WALDVOGEL, director and vice-president of the Yale & Towne Mfg. Co., died of pneumonia at his home in New Rochelle, N. Y., on Nov. 13. He entered the Yale & Towne service in 1905 as a traveling salesman. Five years later he was transferred to New York as assistant to the general manager and in 1912 was appointed assistant general manager. He succeeded Walter C. Allen, the present president of the company, as general manager in 1916. Mr. Waldvogel was appointed vice-president in charge of sales in 1923. In April of this year he retired from active service, but remained as a director and vice-president.

TRACY WALDO GUTHRIE, vice-president of the Hillman Coal & Coke Co., Pittsburgh, and widely known in the steel industry, died at his home at Sewickley, Pa., on Nov. 15, aged 62 years. He was born at Portsmouth, Ohio, and began his business career in the railroad and coal industries in the Hocking Valley of Ohio. He served for a time as president of the Sunday Creek Coal Co. and later went to Pittsburgh, where he served as president of the old Republic Iron & Steel Co. when its headquarters were in that city. He then became president of the Standard Welding Co., Cleveland, but returned to Pittsburgh in 1916 as president of the old United Coal Corp., later the Hillman company. He had retired from active business two years ago, having retained the title of vice-president.

HENRY T. PRATT, who was long well known in the wire trade of the Central West, died at his home in St. Petersburg, Fla., Nov. 11, aged 76 years. He was connected with the sales department of the American Steel & Wire Co. for 32 years of his active business life, having been for a considerable part of that period the company's district sales manager at Cleveland.

WILLIAM A. HOLMES, for many years president of the Enterprise Iron Works, Indianapolis, died recently at Franklin, Ind., aged 59 years.

HENRY LANG, vice-president of the Ingersoll-Rand Co., New York, died at his home in Montclair, N. J., after a long illness on Nov. 10, aged 66 years.

PERSONAL

VICTOR O. HOMERBERG, associate professor of physical metallurgy at the Massachusetts Institute of Technology, has been appointed technical director of the Nitalloy Corp., New York. He received the degrees of Bachelor of Science in chemical engineering and Doctor of Science in metallurgy from Massachusetts Institute of Technology. Dr. Homerberg has written a number of articles on nitriding for THE IRON AGE and has acted as consulting metallurgist for a number of manufacturing companies.

E. A. EMERSON, vice-president and managing director of Armco International Corp., and W. L. ALLEN, president, Sheffield Steel Corp., Kansas City, Mo., both subsidiaries of the American Rolling Mill Co., sailed for Europe Nov. 14 in the interest of the company's foreign business. They will go to France first and then to Armco's plant at Shotton, England, where they will spend some time. E. J. GOLDSCHMIDT, Armco statistician, who will spend some time at Shotton in connection with the program that has been mapped out for that division, sailed for England on Nov. 15.

GEORGE J. MEAD, vice-president in charge of engineering of the Pratt & Whitney Aircraft Co., has been made head of the experimental research division of the United Aircraft & Transport Corp., the holding company for Pratt & Whitney Aircraft Co. and the Chance Vought Corp.

W. H. SCANLON has been appointed manager of the bar and structural department, Weirton Steel Co., Weirton, W. Va. He is well known in the Pittsburgh district steel industry, and was identified for a number of years with the Carnegie Steel Co. Recently Mr. Scanlon has been associated with W. J. Rainey, Inc., Pittsburgh, dealer in coal and coke. He will assume his new position immediately, as the new bar and structural mill at Weirton will be placed in operation on Dec. 15.

LAWRENCE H. UNDERWOOD, general superintendent of the Indiana Harbor plant of the Youngstown Sheet & Tube Co., has been promoted to the post of district manager for the Youngstown interests in the Middle West. Previous to making his home in Gary, Mr. Underwood had served as a blast furnace superintendent in the eastern plants of the National Tube Co. In 1915 he left the employ of the Illinois Steel Co. to become blast furnace superintendent for the Youngstown concern in its Ohio plant. He returned to Gary in 1925 and later received appointment as general superintendent of the Youngstown plant at Indiana Harbor.

ARCH J. MCFARLAND, recently general manager of the Follansbee, W. Va., works of the Follansbee Brothers Co., Pittsburgh, has been appointed assistant to the president of the Wheeling Steel Corp., Wheeling, W. Va. Mr. McFarland has had a long experience with the Wheeling company and its predecessors, having served for a number of years as manager of the Portsmouth, Ohio, works of the Whitaker-Glessner Co. When this company became a part of the Wheeling Steel Corp., he continued at the Portsmouth works, later going to Steubenville, Ohio, as general manager of the corporation's plant there. He left this position to go with the Follansbee company about five years ago.

HERMAN WEBER, who has rendered 68½ years of continuous service to the Barnett Foundry & Machine Co., Irvington, N. J., retired on pension on Oct. 31. He started as an office boy on April 6, 1862, and was later promoted to various positions in the foundry department. After he had been with the company 25 years, he was made foundry superintendent, which position he held for 25 years. For the past 18 years he has been foreman of the pattern shop.

F. L. ESTEP, of the firm of Perin & Marshall, consulting engineers, New York, left Nov. 14 for a two to three months' stay in England.

CHARLES A. CARPENTER has been appointed district representative, with headquarters at 1124 Park Building, Pittsburgh, for the heating division of the Wickes Boiler Co., Saginaw, Mich.

R. B. DICKSON has been elected president of the Kewanee Boiler Corp., Kewanee, Ill., and B. F. BAKER has been made chairman of the board. E. F. WAGNER has been named secretary and ARTHUR COOK is now treasurer of the company.

JULIAN B. GREENSTREET, superintendent, Olney Foundry Co., led a discussion on the operation of the cupola at the regular meeting of the Philadelphia Foundrymen's Association, Inc., Nov. 12. The meeting was held at the Northeast Shrine Club, Fox Chase, Pa.

C. T. DARE has been added to the sales staff of the Dayton, Ohio, office of the Ex-Cell-O Aircraft & Tool Corp., Detroit, covering Indiana and southern Ohio.

Norfolk & Western Inquires for 73 Items

AN inquiry for 73 items of shop equipment from the Norfolk & Western Railroad is the brightest spot in a machinery situation that shows no general recovery from the dullness of the past few months.

This list, the largest to be issued by a railroad in many months, calls for bids on miscellaneous machine tools, compressors, pumps, blowers and other equipment.

In several of the leading machine tool selling centers there is a fair

volume of inquiry, but the tendency among buyers is to postpone the placing of orders, even when fairly definite needs exist, until there is more evidence of general business improvement. In many instances, this means that contemplated purchases probably will go over until after Jan. 1.

Most of the interest in machine tools has to do with methods that will cut production costs, it being quite generally believed that 1931 business will be on a highly competitive basis.

MACHINERY Business in General Shows No Improvement

Even when convinced that savings can be made, many companies are not desirous of adding to capital investment until after the 1930 books have been closed.

It is expected that an inquiry will be issued soon for machine tools for the Lane Technical High School, Chicago. Seven machine shops in this school will require 25 lathes each, as well as some millers, shapers and drill presses. A total expenditure of about \$300,000 is contemplated.

New York

The Norfolk & Western Railroad, Roanoke, Va., Clyde Coker, purchasing agent, has issued an inquiry for 73 items of shop equipment, including miscellaneous machine tools, compressors, pumps, blowers, electric hoists, vacuum cleaning outfit, paint mixers, etc. This is the first railroad inquiry of size in many months.

Machine tool buying in this district has been at extremely low ebb in the past week. Though October was dull, it is indicated that the volume of sales this month may be lower. Machine tool sellers find it difficult to close orders even when fairly definite needs are under consideration. The tendency among buyers seems to be to postpone purchases until there is more evidence of general business recovery. In all probability this means that most of the pending business will go over until after Jan. 1.

Chicago

The future of the local machine tool market is uncertain. Several sizable industrial lists have slowly been taking form, but it is indefinite as to when they may come before the trade. Railroad mechanical departments are busy sizing their needs and there are prospects that the Santa Fe, Union Pacific, and possibly the Milwaukee Road, will be buyers of machine tools early in 1931. The Norfolk & Western is sending out a list.

Requirements for the Lane Technical High School, Chicago, are expected soon. Seven machine shops in this school will each require 25 lathes as well as a few millers, shapers and drill presses. There will also be a

large wood-working department. Expenditures for this equipment may run as high as \$300,000.

Cleveland

While machine tool builders and dealers continue to receive a fair volume of single tool inquiries, sales were exceedingly light the past week. November probably will show no gain in business over that of October. Metal-working plants are showing an interest in replacement machinery to cut down production costs which is responsible for much of the inquiry now coming out. However, there is a general disposition to defer buying until general business improves.

Pittsburgh

Activity in the machinery market in this district is centered on inquiry for 1931 estimating purposes. While it is by no means certain that all of the tools and equipment now being figured will be bought in the coming year, the forward prospects of the companies concerned ordinarily offer a fair gage of activity and thus far they promise a year of good buying. New inquiry for immediate placing is negligible and orders are scarce.

Milwaukee

While little progress is being made toward more active business by the machine tool trade, the outlook is generally regarded as more promising. There is a fair amount of inquiry and some shops report a more encouraging tone. No large purchases are contemplated, however. Industries apparent-

ly are doing little beyond making urgent replacements so far as actual orders are concerned. Probably the greatest handicap is the state of the automobile industry, which has been able to contribute but little business to the machine tool industry.

Cincinnati

Machine tool demand the past month and a half has been sustained at a fairly even rate. New orders call for only one or two tools at a time and come from widely scattered sources. Inquiry also is steady, but retrenchment policies prevent the placing of orders at the present time. Plant operations are still below 50 per cent, but no further change in production rates has been made in the past month. The trade generally is optimistic regarding the future, although no improvement is expected before the middle of the first quarter.

New England

Most of the recent business in this district represented buying by tool builders themselves. Several fairly expensive tools were involved. Other industries, previously showing interest in equipment to the extent of obtaining prices, apparently will not purchase until inventories are out of the way. It is certain, however, that with even moderate betterment in general business considerable equipment will be bought to replace old machines. The city of Boston is in the market for lathe equipment for its Brighton district school. Used tool dealers have accumulated a well assorted and conditioned stock.

New York

CONTRACT has been let by General Electric Co., Schenectady, to George A. Fuller Co., 597 Madison Avenue, New York, for one-story addition to branch plant at Pittsfield, Mass., 150 x 500 ft., primarily for manufacture of transformer tanks and equipment, to cost close to \$1,000,000 with equipment. Company is considering addition to plant on River Road, Schenectady, for electric refrigerator division, to cost over \$75,000.

Standard Solophone Mfg. Co., 120 West Eighteenth Street, New York, manufacturer of toys, has leased a floor in building at 27 West Twentieth Street for expansion.

Gulf Refining Co., Frick Annex, Pittsburgh, has work under way on new oil storage and distributing plant on site recently named Gulfport, S. I., to cost over \$500,000 with equipment.

Donigan & Nielson, 745 Third Avenue, Brooklyn, manufacturers of commercial automobile bodies, van bodies, etc., have awarded general contract to Ajello Construction Co., 142 Montague Street, for a one-story addition, to cost about \$35,000 with equipment.

Linde Air Products Co., 30 East Forty-second Street, New York, manufacturer of industrial oxygen, welding equipment, etc., has site at Chattanooga, Tenn., and contemplates new plant after first of year, to cost over \$75,000 with equipment. Company engineering department will be in charge.

State Department of Correction, Albany, N. Y., Dr. Walter N. Thayer, commissioner, will equip a number of new mechanical shops at State institutions, including shop units at Dannemora, Sing Sing, Comstock and Auburn. A power

plant will also be built at last-noted place. Shops and power plants will be erected at two new prisons, for which plans are in progress, one in Sullivan County, and at a new institution for defective delinquents.

Henry J. Nurick, 44 Court Street, Brooklyn, architect, has plans for a four-story automobile service, repair and garage building, to cost over \$100,000 with equipment.

John R. Phillips, 194 Winkee Avenue, Poughkeepsie, N. Y., and associates have organized Waterproof Super Metal Products Co., Inc., with capital of \$250,000 and will operate local plant for manufacture of line of metal goods. Lizern L. Snyder, Poughkeepsie, is interested in new company.

Starrett Investing Corp., 101 Park Avenue, New York, has plans for a 20-story industrial building for light and heavy manufacture on Ogden Street, Newark, to cost \$8,500,000. Part of structure will be designed for storage and distributing service, with mechanical-handling facilities. Erection contract will be awarded to Starrett Brothers & Eken, Inc., same address. Yasuo Matsui, 101 Park Avenue, New York, is architect.

Frederic P. Humphreys, head of Frederic P. Humphreys, Inc., 230 Park Avenue, New York, builder of yachts, has organized Humphreys Yacht Construction Co., to operate a yacht-building and repair plant at Keyport, N. J.

Board of Education, Manasquan, N. J., is considering installation of manual training equipment in new three-story high school, to cost about \$250,000, for which bids will soon be asked on general contract. Coffin & Coffin, 522 Fifth Avenue, New York, are architects.

Board of City Commissioners, City Hall, Jersey City, N. J., has awarded

general contract to Auf Der Heide Contracting Co., 443 Sixteenth Street, West New York, N. J., for three-story and basement power plant and mechanical laundry, 40 x 63 ft., to cost over \$85,000 with equipment. John T. Rowland, 30 Journal Square, Jersey City, is architect; Frank Sutton, 140 Cedar Street, New York, is mechanical engineer.

Sander Mfg. Co., 298 Eighth Avenue, Newark, manufacturer of meat-chopping machines, parts, etc., has plans for a one-story addition to machine shop, 45 x 92 ft., to cost close to \$20,000 with equipment.

New England

WORK is under way by Danbury & Bethel Gas & Electric Light Co., Danbury, Conn., on one-story equipment storage and distributing plant, 61 x 161 ft., with repair and service facilities, to cost over \$75,000 with equipment. Philip N. Sunderland, Danbury, is architect.

Wilmington Packing Co., Inc., Wilmington, Mass., has awarded general contract to Thomas Mulcare, Inc., 66 Western Avenue, Brighton, Mass., for rebuilding three-story meat-packing plant recently destroyed by fire, to cost over \$50,000 with equipment.

Massachusetts Utilities Associates, Inc., 150 Congress Street, Boston, operating electric light and power properties, is arranging bond issue of \$5,000,000, part of fund to be used for extensions and improvements in power plants and system.

Atlantic Gypsum Products Co., Free-mans Point, N. H., is planning to rebuild part of plant recently destroyed by fire, with loss close to \$100,000, including equipment.

Atlantic Pressed Steel Co., Inc., Cam-

INDUSTRIAL ACTIVITY

Prospects Revealed by a Survey of Construction Projects

NEW construction in the past week requiring machinery and other equipment reached a total of \$18,600,000, in addition to which, bond issues by public utilities and municipalities total \$32,700,000. This total of new construction compares with \$121,000,000 of projected work a week ago and \$42,000,000 two weeks ago. Of this week's reports about \$6,000,000 is in industrial projects and railroad improvement, \$9,500,000 in municipal building for electric and water service, airports and other projects, \$1,750,000 in public utility improvements and \$1,500,000 in expenditures by the oil industry.

Included in purely industrial projects are additions and improvements to metal-working plants in 15 cities of the country totaling more than \$800,000, and additions to ice-making and refrigerating plants in Michigan, Kansas, Texas, California, Georgia and Connecticut totaling close to \$1,000,000. Among the large industrial projects are additions to a cotton mill at Saco, Me., to cost about

\$500,000 and a chemical plant at Houston, Tex., which will also cost about \$500,000. Most of the additions to metal-working plants are small, but a foundry addition in Cincinnati calls for about \$150,000 and a new mill for the United Engineering & Foundry Co., in Canton, Ohio, will cost about \$100,000 with equipment.

Expansion by public utilities includes a \$1,500,000 hydroelectric development on Mountain Creek, Tex., by the Dallas Power & Light Co., and a \$100,000 electric power plant at Orleans, Neb. Among oil company improvements are a \$750,000 refinery and storage tanks at East St. Louis, Ill., for the Lubrite Refining Co. and a \$500,000 storage and distribution plant at Gulfport, Staten Island, New York, for the Gulf Refining Co.

Vocational school construction at Dover, Mass.; Big Creek, W. Va.; Manasquan, N. J.; Kansas City, Mo.; Covington, Ky.; New Orleans and Boston totals more than \$2,000,000 compared with about \$3,000,000 a week ago.

bridge, Mass., recently organized by Thomas J. Crowley, 61 Lynn Street, Everett, Mass., and associates with capital of \$50,000, plans operation of local plant for manufacture of steel and stamped metal goods. Mr. Crowley will be treasurer; Stephen F. Martin is president.

Moore Special Tool Co., Bridgeport, Conn., has plans for a one-story machine shop, 35 x 70 ft., to cost about \$30,000 with equipment.

Southern New England Ice Co., Hartford, Conn., will soon call for bids for one-story ice-manufacturing plant at New Britain, Conn., to cost over \$100,000 with machinery. R-B Engineering Corp., 11 West Forty-second Street, New York, is engineer.

York Mfg. Co., Saco, Me., operated by New England Public Service Co., 131 State Street, Boston, will install electrical power equipment and machinery in connection with expansion and improvements at cotton mill to cost over \$500,000.

J. L. Ferguson Co., Joliet, Ill., manufacturer of automatic packaging machinery, parts, etc., has arranged for a merger with National Packaging Machinery Co., Newton, Boston, manufacturer of kindred equipment. Headquarters of consolidated company will be established at Joliet and expansion carried out. J. L. Ferguson will be president.

School Board, Dover, Mass., is considering installation of manual training equipment in new two-story senior and junior high school, to cost about \$175,000. Shepard & Stearns, 65 Franklin Street, Boston, are architects.

Lowell Bleachery, Lowell, Mass., on Nov. 24 will sell at auction all its equipment, including machine shop, blacksmith shop and woodworking.

Philadelphia

WORK will be placed under way early in December by Sun Oil Co., 1608 Walnut Street, Philadelphia, on oil storage and distributing plant at South Amboy, N. J., where waterfront site was recently acquired, to cost close to \$200,000 with equipment.

Tinius Olsen Testing Machine Co., 500 North Twelfth Street, Philadelphia, has awarded general contract to Franklin M. Harris & Co., 1520 Parrish Street, for one-story addition, to be used in part for storage and distribution, to cost \$69,000 with equipment. George S. Idell, Corn Exchange Building, is architect.

John G. Lorenz Corp., Thirty-third and Reed Streets, Philadelphia, manufacturer of steel and metal products, has leased space in building at Sixteenth and Reed Streets for expansion.

Merchants & Miners Transportation Co., Pier 18, South Wharves, Philadelphia, will soon take bids for rebuilding machine shop, wood-working shop and other buildings and pier structures recently destroyed by fire, with loss of over \$100,000.

Eastern Valve Co., Hanover, Pa., recently organized by J. V. Emig, Hanover, and associates with capital of \$30,000, plans operation of local factory for manufacture of valves and kindred engineering specialties. Frank Drals, Highland Township, Adams County, Pa., will be one of heads of new company.

Borough Council, Hatfield, Pa., will soon take bids on general contract for a new municipal electric light and power plant, to cost over \$70,000 with ma-

chinery. S. W. Franklin, Lansdale, Pa., is engineer.

Servicized Products Corp., 53 West Jackson Boulevard, Chicago, manufacturer of building materials, has secured permission for abandonment of C, D, E and F Streets, between Church and Spruce Streets, South Wilmington, Del., for erection of new plant in connection with other property recently secured in that district, initial works to cost \$50,000. Local headquarters are in Chamber of Commerce Building. E. O. Seeley is vice-president and local manager.

Trenton Potteries Co., North Clinton and Ott Streets, Trenton, N. J., manufacturer of sanitary ware, has asked bids on general contract for a one-story addition, to cost over \$45,000 with equipment. Lockwood Greene Engineers, Inc., 100 East Forty-second Street, New York, is architect and engineer.

L. J. Bordo Co., Philadelphia, has been organized with capital of \$50,000 to take over and expand company of same name with plant at Twelfth and Thompson streets, manufacturer of valves, gages, regulators and kindred engineering specialties. New company is headed by L. J. Bordo and Henry N. Christmas.

South Atlantic

A THREE-STORY building at 22 West Pratt Street, Baltimore, has been leased by Chusid Sign Co., 412 East 125th Street, New York, manufacturer of electric signs and displays, for new branch plant.

Public Improvement Commission, City Hall, Baltimore, plans installation of manual training equipment in new three-story and basement Northeast junior high school to cost \$500,000, for which bids will soon be asked on general contract. William W. Emmart, Union Trust Building, is architect. H. J. Leimbach is supervising engineer for commission.

Crown Cork & Seal Co., Highlandtown, Baltimore, manufacturer of bottle seals, etc., plans rebuilding part of plant recently destroyed by fire, including one-story grinding unit and storage and distributing plant, with loss over \$100,000.

Virginia-Carolina Chemical Co., Richmond, Va., manufacturer of commercial fertilizers, etc., has plans for two factory branches and distributing plants at Memphis, Tenn., and Jackson, Miss., to cost over \$50,000 with equipment.

Atlantic Ice & Coal Co., 106 Washington Street Viaduct, Atlanta, Ga., is considering erection of two new ice-manufacturing plants at Macon and Augusta, Ga., each to cost over \$40,000 with machinery. G. A. Roberson is company engineer in charge of construction.

Coca-Cola Bottling Co., Atlanta, Ga., has plans for new two-story plant at Swainsboro, Ga., with installation of automatic bottling machinery, handling equipment, etc., to cost over \$40,000. Pringle & Smith, Norris Building, Atlanta, are architects.

City Council, Bristol, Va.-Tenn., has awarded general contract to Bristol Steel & Iron Works, Bristol, for all-steel hangar unit at municipal airport, to include repair and reconditioning facilities.

Board of Public Works, Aiken, S. C., has plans for extensions and improvements in municipal electric light and power plant, including installation of additional equipment. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is engineer.

Superior Mineral Products Co., Somerset, Pa., Martin L. Markell, president, is

contemplating new mechanical-washing and clay refining mill at property of E. J. Nelson Kaolin Co., Dry Branch, Ga., recently acquired, totaling over 250 acres. Plant will be used for production of raw material for paper and other industries, and will cost about \$150,000 with machinery. Clay mining facilities will also be provided. Robert Spencer Finney, 40 West Fortieth Street, New York, is interested in project.

Virginia Toy & Novelty Mfg. Co., Richmond, Va., recently organized by Marcellus Wright, American National Bank Building, and associates, with capital of \$65,000, plans operation of factory for manufacture of toys and kindred equipment.

Bureau of Yards and Docks, Navy Department, Washington, has plans for extensions and improvements in navy yards and installation of equipment, with other Government public works projects, to cost \$14,000,000. Projects to be placed under way on or before first of 1931 include aircraft structure shop at San Diego, Cal., to cost \$130,000; mine filling plant at naval ammunition depot, Hawthorne, Nev., \$285,000; and shell house and magazine at naval ammunition depot, Lake Denmark, N. J., to cost \$55,000.

Buffalo

ABOUT 7500 sq. ft. in building at 159 Georgia Street, Buffalo, has been leased by Dravo Equipment Co., 302 Penn Avenue, Pittsburgh, contractors' equipment and machinery, for new factory branch and distributing plant, with service facilities. Thomas Lytle will be district manager.

Lock-Rite Corp., Rochester, N. Y., care of John B. Gatenbee, 410 Powers Building, attorney, recently organized with a capital of \$30,000, is planning operation of local factory for manufacture of locking devices and equipment, also mechanical toys.

Comstock Canneries, Inc., Newark, N. Y., has approved plans for a two-story addition, 30 x 60 ft., to cost about \$25,000 with machinery.

Buffalo Auto Spring Co., Inc., Buffalo, recently organized, has leased part of building now being erected at 1450 Michigan Avenue and will establish plant for automobile spring production and repair.

Pittsburgh

WORK will soon begin by Blair Strip Steel Co., Butler Avenue Extension, New Castle, Pa., for rebuilding one-story plant, 50 x 250 ft., recently destroyed by fire, to cost over \$200,000 with equipment.

Baltimore & Ohio Railroad Co., Baltimore, has acquired city block at Johnstown, Pa., part of site to be used for new freight terminal with storage and distributing units, mechanical-handling and other equipment, to cost over \$250,000. Company engineering department is in charge.

Manufacturers' Gas Co., Union Trust Building, Pittsburgh, has made application to extend operations in 11 additional counties in western part of State for pipe lines and other distributing facilities. Company is now operating a gas system in Jefferson, Elk, Warren and McKean counties.

Spear Carbon Co., St. Marys, Pa., has awarded general contract to Rogers Structural Steel Co., Corry, Pa., for one-

story addition, 80 x 120 ft., to cost about \$35,000 with equipment.

Big Creek Consolidated School District, War, W. Va., has voted bonds for \$175,000 for a new high school and plans installation of manual training equipment. Architect will be selected soon.

Three Cities Fuel Corp., Fairmont, W. Va., recently organized with capital of \$2,500,000 by C. W. Watson, Fairmont, formerly president of Consolidation Coal Co., and associates, will take over about 45 coal-mining properties in Harrison, Marion, Barbour, Taylor and Monongahela counties, and plans expansion and improvements at different properties. George M. Alexander, Fairmont, president of Monongahela-West Penn Public Service Co., operating electric light and power properties, is one of principal incorporators.

Detroit

PLANs are under way by General Hydro Carbon Co., Detroit, Alvin F. Traxler, 918 Buhl Building, representative, for initial unit of new plant in Ecorse district, to cost over \$65,000 with equipment.

Borin Brothers Coal & Ice Co., 1635 Westminster Avenue, Detroit, has plans for two-story and basement dry ice manufacturing plant, to cost over \$300,000 with machinery.

General Motors Corp., Detroit, has arranged for purchase of Electro-Motive Co., Keith Building, Cleveland, manufacturer of gas-electric motor cars for railroads, and will operate as a subsidiary under present management. Acquired company is associated with Winton Engine Co., Cleveland, lately purchased by General Motors, likewise to continue production of gas engines, parts, etc., at present location.

Kellogg Co., Battle Creek, Mich., has authorized plans for a new power house at cereal mill at London, Ont., to cost about \$150,000 with equipment. Work will begin soon.

Ulen & Co., 120 Broadway, New York, are negotiating with City Council, Monroe, for installation of a sewage disposal plant, including electric-operated pumping plants, power house and other mechanical divisions, to be operated as a public utility, to cost close to \$1,000,000 with machinery.

Micromatic Hone Corp., Horton and Dubois Streets, Detroit, manufacturer of precision tools and equipment, is considering expansion program in 1931, including additional unit for increase in present capacity. Kirke W. Connor is president and general manager.

City Council, Detroit, is disposing of a bond issue totaling \$19,692,000, proceeds to be used for municipal improvements, including \$1,887,000 for municipal electric light and power department extensions and betterments, and \$8,000,000 for water department expansion and improvements.

Varnish Enamel Paint Co., 555 Going Street, Pontiac, Mich., recently organized with capital of \$100,000, plans operation of local paint and varnish factory. John G. Wood heads company.

Hydraulic Pressed Bearing Co., Niles, Mich., has arranged for increase in common stock from 2000 shares, no par value, to 40,000 shares, with preferred stock remaining at \$200,000, part of proceeds to be used for expansion.

Cleveland

GENERAL contract has been let by Cleveland Trencher Co., 20100 St. Clair Avenue, Cleveland, manufacturer of digging and ditching machinery, to George L. Craig, Inc., 4614 Prospect Avenue, for one-story addition for storage and distribution, to cost about \$30,000 with equipment. Paul S. Schmidt, 4500 Euclid Avenue, is architect.

Hayes Body Corp., Grand Rapids, Mich., manufacturer of automobile bodies and parts, is closing arrangements for purchase of Central Ohio Steel Products Co., Gallon, Ohio, manufacturer of steel truck bodies, steel burial vaults, etc., and will operate as a subsidiary. Purchasing company plans bond issue of \$1,000,000 to provide for purchase and expansion.

Fostoria Screw Co., Fostoria, Ohio, has awarded general contract to J. H. Jones, Fostoria, for a one-story addition, to cost about \$50,000 with equipment.

United Engineering & Foundry Co., Farmers' Bank Building, Pittsburgh, manufacturer of metal-working machinery, heavy mill equipment, etc., is considering addition to branch plant at Canton, Ohio, to cost over \$100,000 with equipment.

Friddle Fender Co., Akron, Ohio, care of Thomas & Buckingham, Second National Bank Building, Akron, attorneys, recently organized by R. R. Friddle, Akron, and associates, plans operation of local sheet metal works for production of automobile fenders and kindred products. Harold A. Mack, Akron, is interested in new organization.

Board of Education, Standard Trust Bank Building, Cleveland, is considering installation of manual training equipment in new James Ford Rhodes High School, to cost about \$800,000, for which bids will be asked on general contract at once, closing Dec. 15. G. M. Hopkinson, architect, is in charge.

Chicago

PERMIT has been issued to Wabash Railroad Co., Railway Exchange Building, St. Louis, for one-story engine house, 40 x 150 ft., with repair facilities at Landers yard, Chicago, to cost about \$40,000 with equipment.

Howe Mfg. Co., 219 St. Johns Court, Chicago, manufacturer of fire control equipment, has leased one-story building, 50 x 108 ft., for expansion.

Mount Vernon Tube Sign & Mfg. Co., Second and Watson Streets, Mount Vernon, Ill., recently formed with capital of \$30,000, plans operation of local factory for manufacture of electric signs and displays. L. L. and R. E. Benoist head new organization.

A. N. Eaton Metal Products Co., Billings, Mont., has awarded general contract to Frank Jacoby, Billings, for new one-story plant, primarily for production of steel culverts for roads, to cost about \$30,000 with machinery.

International Rubber Co., Denver, plans removal of local plant to new works at Pueblo, Colo., for which bids have been asked on general contract, to cost close to \$175,000. Additional equipment will be provided for increased output.

Interstate Power Co., Dubuque, Iowa, is planning extensions and improvements in steam-operated electric power plant at Coleridge, Neb., including installation of additional equipment. Company will also make extensions in transmission lines.

Lincoln Casket Co., Lincoln, Ill., is considering an addition to cost about \$65,

000 with equipment, and will begin work early next year.

Central Illinois Public Service Co., Springfield, Ill., has applied for permission to issue bonds for \$3,000,000, part of fund to be used for expansion and improvements in power plants and system.

Airport committee of Commercial Club and City Airport Committee, Billings, Mont., have plans for a hangar, 80 x 90 ft., at municipal airport, with repair facilities, to cost close to \$30,000 with equipment.

Perfection Gear Co., Chicago, has been formed with a capital of \$250,000, to take over and consolidate company of same name and National Gear Co., 213 North Morgan Street.

Cornell Johnson Forge Co., Chicago, has been incorporated and has leased plant at 1659 West Seventy-fourth Place, for manufacture of drop forgings ranging up to 8 lb. Hammers and trimming presses have been purchased from Chambersburg Engineering Co., Chambersburg, Pa., and gas-fired furnaces from Peoples Gas Light & Coke Co., Chicago. A. M. Cornell is president-treasurer; T. E. Johnson, vice-president, and A. G. McCaleb, secretary.

Milwaukee

CONSTRUCTION of a plant addition for Hein-Werner Motor Parts Corp., Waukesha, Wis., is in prospect early next spring, resulting from acquisition of Mueller Engineering Works, Racine, Wis., manufacturers of hydraulic jacks. Equipment is being transferred from Racine to Waukesha, and J. J. Mueller and D. J. Mueller, principal owners of Racine concern, have become associated with engineering staff of Hein-Werner company, which is closely identified with Waukesha Motor Co., manufacturer of heavy duty gasoline engines and Diesel motors.

A. E. Martin Foundry & Machine Co., 1521 West Bruce Street, Milwaukee, sustained loss of \$40,000 by fire in its gray iron foundry on Nov. 8. Company specializes in motorcycle and airplane engine castings. It is planned to replace unit immediately.

Wesley Steel Treating Co., 1333 West Pierce Street, Milwaukee, has plans for a research laboratory, 40 x 150 ft., two stories and basement, but probably will not undertake construction until next spring. Cost is estimated at \$50,000. Company recently completed a two-story student training room, 20 x 50 ft., and installed two large ovens, one gas and one electric.

Wausau Motor Parts Co., 125 West Washington Street, Wausau, Wis., specializing in piston rings, has postponed erection of new plant, to cost about \$100,000, because of failure to reach agreement with Common Council relative to new plant site.

Milwaukee Valve Co., 2371 Burrell Street, Milwaukee, has placed contract with Ed. Steigerwald & Son, 5310 State Street, for two additions, 30 x 67 ft., two stories, and 30 x 40 ft., one-story, for extensions of foundry and machine shop. John Fraser, Jr., is president and general manager.

Village of Amherst, Wis., L. A. Hanson, clerk, closes bids Nov. 28 for new pumping station, 25 x 36 ft., requiring two 300-400 gal. per min. centrifugal pumps with industrial gas engine drive. W. G. Kirchhoffer, Madison, Wis., is consulting engineer.

Foundry of F. Rassmann Mfg. Co., Beaver Dam, Wis., manufacturer of farm

equipment, was damaged by fire on Nov. 12. Building requires complete replacement. Malleable Iron Range Co. has offered use of its facilities pending reconstruction.

Cincinnati

GENERAL contract has been let by Buckeye Foundry Co., 2257 Buck Street, Cincinnati, to D. Meinken & Son, 2143 Barnard Street, for one-story addition, 120 x 280 ft., to cost about \$150,000 with equipment.

Kroger Grocery & Baking Co., 457 Cleveland Avenue, Columbus, Ohio, has asked bids on general contract for two-story addition to power plant, to cost over \$50,000 with equipment.

Container Corp. of America, Inc., Circleville, Ohio, manufacturer of corrugated containers, etc., is considering rebuilding part of local mill recently destroyed by fire, to cost over \$75,000 with equipment. Headquarters are at 111 West Washington Street, Chicago.

Citizens of Paris, Ky., have approved a bond issue of \$150,000 for a municipal electric light and power plant and plans will be prepared soon.

Board of Trustees, University of Kentucky, Lexington, Ky., has plans for a new two-story farm engineering building, with two one-story wings, to cost about \$75,000 with equipment. Hugh Meriwether, Department of Buildings and Grounds, is architect.

Kentucky Chemical Mfg. Co., Cincinnati, care of Harry Hake, 2400 Gilbert Avenue, architect, has plans for eight one and two-story units, including power house, for manufacture of industrial chemicals, to cost over \$100,000 with machinery.

Board of Education, Covington, Ky., contemplates installation of manual training equipment in new three-story school, 100 x 200 ft., to cost about \$200,000, for which bids have been asked on general contract. Charles L. Hildreth, Coppins Building, is architect. Kinney & Ehlers, Dixie Terminal Building, Cincinnati, are engineers.

Shelby County Institutions Commission, Memphis, Tenn., has plans for a one-story machine shop at County penal farm. An automobile service and garage building also will be erected. Hanker & Cairns, Court Square Building, are architects.

City Milling Co., Newport, Tenn., plans rebuilding of grain and flour mill recently destroyed by fire, with loss close to \$50,000 including equipment.

Indiana

PLANs are under way by Fisher Brothers Paper Co., 118-20 West Columbia Street, Fort Wayne, for a new three-story and basement factory, 35 x 150 ft., to cost over \$65,000 with equipment. A. M. Strauss, Cal-Wayne Building, is architect.

Loogootee Milling & Grain Co., Loogootee, is considering rebuilding portion of grain mill recently destroyed by fire with loss reported at \$75,000, including equipment.

Automatic Service Co., Postal Station Building, Indianapolis, is arranging for maximum assembling facilities for confection vending machines. Company has placed orders for parts for about 15,000

machines and will carry out all assembling at own works.

Grace Mfg. Co., Newcastle, recently organized by Frank A. Grace, Newcastle, and associates, will operate local plant for manufacture of patented clutch mechanisms and kindred equipment invented by Mr. Grace. Russell J. Harter and Walter T. VanCamp, Newcastle, are interested in new company.

South Bend Bait Co., South Bend, manufacturer of fishing tackle, reels, etc., has awarded general contract to R. Solitt & Sons, 518 East Sample Street, for a one-story addition, 100 x 100 ft., to cost over \$65,000 with equipment.

Mars Hill Wood Products Co., Indianapolis, recently organized, has taken over two factory buildings in Mars Hill section, totaling about 20,000 sq. ft. floor space, for production of battery trays for railroads and kindred specialties. James A. Daugherty is president, and H. J. Davry, Jr., vice-president and general manager.

Officials of White Frost Ice Co., Inc., Anderson, have arranged for a reorganization of company to carry out expansion for manufacture of refrigerating equipment, refrigerators and kindred products. Company is headed by T. Chandler Werbe and Edward S. Ridley.

Gulf States

CONTRACT has been let by Dallas Power & Light Co., Dallas, Tex., to W. E. Callahan Construction Co., Kirby Building, for dam and spillway on Mountain Creek, for hydroelectric power project, at a cost of \$1,500,000. Work will begin soon on generating station to cost over \$2,000,000 in addition to sum noted, including transmission lines. Additional units will be installed to develop total rating of 120,000 kw. Company engineering department is in charge.

Hollywood Machine & Iron Co., Hollywood, Fla., plans rebuilding part of plant recently destroyed by fire, with loss over 50,000, including equipment.

Coca-Cola Bottling Co., Lafitte Street, San Antonio, Tex., has awarded general contract to San Antonio Construction Co., Builders' Exchange Building, for one-story addition, to cost about \$40,000 with bottling, mechanical-handling and other equipment.

Orleans Parish School Board, New Orleans, has plans for a new trades school for colored students, to cost more than \$300,000 with equipment. Plans are being considered for a new vocational school center for white students on former site of Presbyterian Hospital, to cost over \$250,000.

Saline Chemical Co., Houston, Tex., recently organized by W. S. Hipp, Houston, and associates, to manufacture industrial chemicals, has secured a site at Pierre Junction, near salt properties, for early erection of plant, with power house, machine shop and other buildings, to cost over \$500,000 with machinery. Salt properties will be developed for raw material supply.

Santa Anna Glass Co., Santa Anna, Tex., is considering new plant near Coleman, Tex., to cost about \$90,000 with machinery.

Hastings Oil Tool Co., Houston, Tex., recently organized with capital of \$125,000 by J. W. Metzler, 1203 Wichita Street, and associates, will operate local plant for manufacture of oil well drill-

ing equipment, parts production and assembling.

Dungan Tool & Equipment Co., Breckenridge, Tex., manufacturer of oil well tools and equipment, has arranged for an increase in capital from \$250,000 to \$375,000 for expansion.

Atchison Produce Co., 595 Sam Houston Boulevard, San Benito, Tex., has asked bids on general contract for a new one-story packing plant, 50 x 200 ft., with cold storage facilities, to cost over \$75,000 with equipment.

A. E. Clausnitz, New Braunfels, Tex., operating a chain of ice-manufacturing plants in central part of State, has acquired site at Taylor, Tex., and contemplates new ice and refrigerating plant, to cost over \$40,000 with machinery.

St. Louis

CITY COUNCIL, Sikeston, Mo., is asking bids until Nov. 24 for a municipal electric light and power plant, including two 600-hp. Diesel engines, with generators, excitors and accessories, water softener, 20,000-gal. capacity oil storage tank and cooling tower, switchboard and auxiliary equipment. Plans and specifications at office of W. A. Fuller Co., 2916 Shenandoah Avenue, St. Louis, engineer.

Fluid Packed Pump Co., Twenty-ninth and Santa Fe Streets, South, Oklahoma City, Okla., has awarded general contract to Harry Reynolds Construction Co., 636 East Seventh Street, for two-story storage and distributing plant, to cost about \$25,000 with equipment.

Steffen's Ice & Ice Cream Co., First National Bank Building, Wichita, Kan., has plans for a two-story and basement ice, refrigerating and ice cream plant, 90 x 200 ft., to cost over \$200,000, including tanks, conveying and other equipment. C. G. Schoelch, Syndicate Trust Building, St. Louis, is architect and engineer.

Western Public Service Co., Scottsbluff, Neb., has plans for a new steam-operated electric power plant at Orleans, Neb., to cost about \$100,000 with machinery. Company also plans erection of high-tension line from Orleans to Holdrege, Neb., to cost about \$40,000.

Plumbers' Supply Co., 323 West First Street, Tulsa, Okla., has awarded general contract to Patterson Steel Co., 801 North Xanthus Street, for a one-story and basement storage and distributing plant, with pipe and mechanical shop, 50 x 165 ft., to cost about \$25,000 with equipment.

Banfield Brothers, Tulsa, Okla., meat packers, plan new plant at Fort Smith, Ark., to cost about \$75,000, including conveying and other equipment.

Board of Education, Kansas City, Mo., plans installation of manual training equipment in new high school at Sixty-fourth Street and Agnes Avenue, to cost about \$500,000. C. A. Smith, Finance Building, is architect.

Lubrite Refining Corp., 3504 Washington Avenue, St. Louis, is erecting a new unit at its plant in East St. Louis, to cost \$750,000 with storage tanks and equipment. It is scheduled for completion about Feb. 1.

J. W. Sloan, Tulsa, Okla., and associates have plans for a hydroelectric generating plant at Siloam Springs, Ark., with power dam 36 ft. high and 300 ft. long, to cost over \$200,000 with machinery. A transmission line will be built. Victor Cochrane, Tulsa, is engineer.

Pacific Coast

AN engineer will soon be selected by Board of City Trustees, Vernon, Cal., to prepare plans for a steam-operated municipal electric light and power plant, for which a bond issue of \$3,900,000 has recently been approved, to include transmission and distributing system. City engineering department will supervise erection and majority of equipment purchases will be made through that office.

Boeing Air Transport Co., Seattle, has leased hangar, 80 x 100 ft., to be erected by Board of City Trustees, Sacramento, Cal., at municipal airport, to cost about \$40,000 with repair facilities. Harry Devine, 1045 Forty-first Street, Sacramento, is architect.

Puritan Ice Co., Guadalupe, Cal., is considering one-story addition to ice-manufacturing plant, to cost over \$100,000 with machinery.

Standard Gasoline Co., Ventura, Cal., is planning addition to gasoline refinery No. 2, to cost about \$50,000 with equipment.

Pacific Gas & Electric Co., 245 Market Street, San Francisco, has plans for an equipment storage and distributing plant with service and repair units at Santa Rosa, Cal., to cost about \$65,000.

Fresno Consumers Ice Co., 702 P Street, Fresno, Cal., has awarded a general contract to W. W. Williamson, 320 Market Street, San Francisco, for rebuilding part of ice-manufacturing plant recently destroyed by fire, to cost about \$40,000 with equipment.

Southern California Edison Co., Los Angeles, has applied for permission to issue bonds for \$5,000,000, part of fund to be used for extensions and improvements in power plants and system.

Sigrud Norman of Sumner Iron Works, Everett, Wash., and associates have organized Paper-Pulp Machinery Corp., with capital of \$50,000, and headquarters at Portland, to operate a plant for manufacture of machinery for pulp and paper mills. A. C. Little, Newberg, Ore., is interested in new company.

Publix Garage, Inc., Seattle, care of Schack & Young, Central Building, architects, has asked bids on general contract for a five-story and basement automobile service, repair and garage building, 116 x 120 ft., to cost \$175,000 with equipment.

Plomb Tool Mfg. Co., 2209 Santa Fe Avenue, Los Angeles, manufacturer of hand-forged tools, has filed plans for a one-story addition, 80 x 80 ft., to cost about \$20,000 with equipment. William J. Moran, 324 West Forty-eighth Street, is architect and engineer.

Carstens Packing Co., Tacoma, Wash., meat packer, has work under way on four-story packing plant, 80 x 160 ft., to cost over 80,000 with machinery, for which general contract recently was let to Standard Construction Co., Washington Building.

Canada

SEVERAL contracts have been placed for a three-story ore dressing and metallurgical laboratory at Ottawa, Ont., to cost \$103,000, for the Federal Department of Public Works, Hunter Building. Alexander Garvock, Regent Theatre Building, Ottawa, is general contractor.

Plans are under way by Ontario Engineering Co., Riverview Boulevard, Fort Erie, Ont., for a \$60,000 waterworks plant

and system at Caledonia, Ont. J. W. Avery is clerk.

New Brunswick Electric Power Commission, 56 Canterbury Street, St. John, N. B., has awarded several contracts for steam power plant at Minto, N. B., to cost \$800,000. Equipment will be purchased. United Engineers & Contractors, 1010 St. Catharine Street, West, Montreal, are in charge.

Lumber mill of Fraser Valley Tie & Timber Co., Ltd., South Westminster, B. C., destroyed by fire Nov. 1, will be rebuilt and new equipment purchased at total cost of \$100,000.

Foreign

PLANs have been approved by Monterrey Light & Power Co., Monterrey, Mexico, for new steam-operated electric generating plant at Colonia Bella Vista, to cost close to \$1,000,000 with transmission lines. C. Galbraith will be construction superintendent for project.

Ford Motor Co., Dearborn, Mich., has made proposition to Government of Poland, Warsaw, for new assembling plant at Port of Gdynia, Poland, to cost about \$500,000 with equipment.

Societe Electro-Metallurgique de Dives, Paris, France, has acquired Compagnie Generale de Mines, with copper-mining properties in Bulgaria, Turkey, Spain, Anatolia and Morocco. Purchasing company plans expansion in copper mines and will use raw material at its electrolytic copper refinery in France. In connection with latter works, company is arranging for organization of new com-

pany with Compagnie Generale Electrice, Paris, to take over and increase capacity.

British-American Tobacco Co., Liverpool, England, is planning to rebuild part of plant recently destroyed by fire, with loss over \$500,000.

A power company in Sweden is planning erection of series of power dams near Pilsborg, at southern end of Lake Bolmen, for hydroelectric power development. Project includes high dikes for preserving agricultural lands at northern end of lake, with electric-operated pumping plants for draining service. Information at office of Bureau of Foreign and Domestic Commerce, Washington, reference Sweden No. 7254.

Mines Domaniales de Potasse, Ltd., Paris, France, operating potash and bromine mining properties at Saint Therese in Alsatian district, is planning increase in present capacity and will install additional equipment.

Hungarian Ammonia Mfg. Co. (Ungarische Ammoniakfabrik), Petfueroe, Pester, Hungary, recently organized with capital of 4,000,000 pengoe (about \$700,000), is planning erection of new plant for production of ammonia and other products, using lignite as raw material, initial unit to cost over \$300,000 with machinery. New company is affiliated with Pester Ungarischer Commerzialbank, Petfueroe.

British Aluminum Co., London, England, is arranging for increase in capital of about \$4,374,000, and making capitalization £2,400,000 (about \$11,664,000), part of fund to be used in connection with Lochaber hydroelectric power development.

New Trade Publications

Oil Circuit Breakers.—General Electric Co., Schenectady, N. Y. Seven-page booklet, illustrating and describing explosion-chamber, oil circuit breakers for new N. E. L. A. ratings. Listings of types and ratings are given.

Industrial Lighting.—Thompson Electric Co., 1438 West Ninth Street, Cleveland. Six-page folder entitled "Vibration as Related to Industrial Lighting," which deals with the elementary characteristics of vibration.

Aftercoolers.—Pennsylvania Pump & Compressor Co., Easton, Pa. Bulletin 150 of eight pages, illustrating and describing several types of aftercoolers for cooling and drying air after it is compressed and before it is delivered into service pipes. Table shows sizes and capacities.

Waste-Heat Boilers.—Foster Wheeler Corp., 165 Broadway, New York. Bulletin WB-30-2, of 15 pages, illustrates and describes several designs, installations and details of construction of boilers using waste gases at temperatures above 500 deg. Fahr.

Time Switch.—Sangamo Electric Co., Springfield, Ill. Circular dealing with the Sangamo time switch, essentially an electrically-wound Hamilton-Sangamo clock, arranged to trip a mercury-tube switch. The dial is arranged to open or close the switch as desired through a cycle of 24 hr.

Forgings.—Kropp Forge Co., Chicago. A 94-page catalog on steam and drop hammer forgings and flanges, and containing technical data of value to engineers.

Automatic Stoker.—Whiting Corporation, Harvey, Ill. Bulletin of 46 pages describing the Whiting automatic stoker, which burns cheap coals under boilers of 25 to 250 hp. rating. Records of fuel consumption, etc., are incorporated. Line cuts and installation views are used as illustrations.

Industrial Control Equipment.—General Electric Co., Schenectady, N. Y. Catalog GEA-606B, of 205 pages, divided into sections which include descriptions and illustrations of a.c. and d.c. hand starters, a.c. and d.c. speed regulators, accessories, d.c. and a.c. drum switches and resistors, d.c. magnetic controllers, a.c. and d.c. printing press controllers, a.c. magnetic controllers, rheostats and resistors, limit switches, solenoids, solenoid valves and brakes, and general information. Tables of prices and standard ratings are given.

High-Pressure Steam Turbines.—De Laval Steam Turbine Co., Trenton, N. J. Booklet E-1141 of 16 pages, which deals with the early work of Dr. De Laval, inventor of the centrifugal milk and cream separator. Illustrations showing early designs compared with the up-to-date types are featured.

Variable-Speed Transmission.—Link-Belt Co., Philadelphia. Book No. 1274 illustrates and describes a new variable-speed transmission employing a positive chain drive.

Self-Synchronous Motors.—General Electric Co., Schenectady, N. Y. Bulletin of 8 pages, dealing with Selsyn motors for remote signaling, control and indication.

Six-Day Blast Furnaces

Ralph Sweetser Believes There Are Times and Conditions Warranting Weekly Shutdowns

A SIX-DAY week operation for steel plant blast furnaces was advocated by Ralph H. Sweetser, assistant to the vice-president of the American Rolling Mill Co., Columbus, Ohio, at a meeting of the Ohio Section of the American Institute of Mining and Metallurgical Engineers, held in Columbus, Nov. 14. Mr. Sweetser made this recommendation in a paper on blast furnace practice, old and new, in which he gave an interesting account of a trip he made recently to visit the remains of ten old charcoal blast furnaces in Greenup and Carter counties in northeastern Kentucky that were operated from 1818 to 1892 in what is known as the Hanging Rock district.

Mr. Sweetser's recommendation for the six-day week followed his reference to an article on the operation of a typical Hanging Rock hot blast charcoal furnace by John Campbell, which was printed in the *Journal of Charcoal Iron Workers*. Mr. Sweetser mentioned the practice of suspending work on the Sabbath and quoted Mr. Campbell as follows: "We have never been able to appreciate the various imaginable difficulties which were claimed to attend this procedure, not being able to recognize the wide difference between stopping 24 hr. to observe the day or suspending operations 24, 48 or 72 hours to clean boilers or to make repairs to engines or hot ovens. We believe it to be merely a question of dollars and cents."

Continuing, Mr. Sweetser said: "This is a part of the old charcoal iron blast furnace practice that I wish now to recommend to the present-day blast furnace practice for steel plants making hot metal for open-hearth furnaces, or for the Bessemer department. Such a practice would prevent the need of pigging so much cold metal over Sundays and holidays and would help to stabilize the supply of surplus pig iron in this country."

"In other words, I now advocate a six-day week for the iron blast furnace in all cases where there is not a continuous demand for the blast furnace gas, for coke ovens or for power supply." A prominent Chicago blast furnace man told him recently, he added, that it was usual practice with him to bank the furnace for a day or so over holidays whenever there was no demand for the hot metal at the steel plant. This prevented the piling of cold pig, and no serious difficulty was found in shutting down and starting up the blast furnace. It required only a little extra coke.

The Howard furnace, Mr. Sweetser referred to, had a daily capacity of 15 tons of hot blast charcoal iron. As the smallest blast furnace in the Hanging Rock district, he listed Pine Grove

furnace, which was 17 ft. high, had a bosh diameter of 6 ft. and one tuyere 2½ in. in diameter. It went out in 1881 for want of charcoal. The Argillite furnace, the ruins of which he visited, was built in 1818 and had a capacity of one ton of cold blast pig iron in 24 hr. This furnace was blown by a water wheel blowing engine, which had a long shaft for operating a hammer to hammer out charcoal blooms. These were then heated and hammered into slabs and carried down the Ohio River to Louisville, where they were rolled into sheets and bars.

A remarkable specimen of the old time square sandstone stack was found in the ruins of the Laurel furnace. The entire lower half of the stack was cut out of the solid sandstone cliff and above the solid sandstone rock were 12 courses of cut sandstone. The tuyere arch was cut from solid rock and the inwall lining was of cut sandstone. The speaker found the best specimen of the old square stone stack in the Boone furnace, of which the hearth lining was made of solid sandstone blocks, these being cut out in front to help form the circle of the hearth.

Dr. O. E. Harder, associated with the Battelle Institute, discussed alloys of iron, their past and present uses. President William H. Bassett, of the American Institute of Mining and Metallurgical Engineers, spoke on non-ferrous metals. Dr. H. Foster Bain, secretary of the institute, spoke on metals in the economic rehabilitation of Europe, and R. C. Allen, Oglebay, Norton & Co., Cleveland, spoke on the iron resources of Russia. An address of welcome was delivered by Dr. H. W. Gillett, director of the Battelle Institute, at which the meetings were held.

Warns Buyers Not to Drive Prices Lower

"The steel industry, in the face of tremendous handicaps, is maintaining the high level of wages paid in 1929 in order to preserve purchasing power, and buyers of raw and semi-finished steel should bear this in mind in their constant striving to drive prices lower and lower," said George H. Charls, president, National Association of Flat Rolled Steel Manufacturers, before the Cleveland Advertising Club on Nov. 14.

"Prices of flat rolled steel have been deflated to approximately pre-war levels," said Mr. Charls. "Freight rates on the material necessary to make steel have increased 100 per cent over pre-war rates. Wages are 100

per cent higher than in 1913. Once it was considered necessary to reduce wages in periods of depression. Today, the entire steel industry accepts the principle that such reductions only reduce purchasing power and delay the return of prosperity. Industrial buyers pushing for lower prices on steel should be mindful of their joint responsibility in helping the steel industry to maintain the purchasing power of its employees."

Rustless Steel to Be Used Extensively in Theater

Chrome-nickel alloy as a medium of interior decoration will have one of its most extensive uses in the new Earl Carroll theater, at Broadway and Fiftieth Street, New York. The interior decorative scheme of the playhouse will combine black velvet and Allegheny metal. On the sides of the auditorium, in sharp contrast to a black velvet background, will be pendant-like decorative features in silver-colored plaster, in which vertical strips of Allegheny metal will frame and hide colored lighting tubes. There will be six of these decorative units on each side of the auditorium. The ceiling is to be of silver-colored plaster, with 13 decorative channels of the metal, each containing the hidden Neon tubes, running forward from the rear of the auditorium and curving down to the proscenium arch.

In the basement foyer leading to the bar there will be a semi-circular niche of the alloy, fluted, again with hidden lighting tubes. Other features of this foyer are two large decorative columns of the metal, 14 ft. high.

A prominent feature of the theater will be the main lounge on the mezzanine floor. This will be decorated with four big mirrors, 20 ft. high by 12 ft. broad, separated by columns of the same height and 4 ft. in diameter, of the metal. Beams of the same metal will ornament the ceiling of the lounge. The balcony soffit offers another interesting use of the metal. Here 14 etched strips of the alloy, a foot wide, are arranged in a modified fan design, the strips again hiding lighting tubes.

All the doors of the auditorium and lounges, sixteen in all, are to be of the same metal, in striking modern designs. The metal motif will be carried even to the sign on the front of the theater. The name "Earl Carroll" is to be in letters of the alloy, 4 ft. 6 in. high, with channels for lighting tubes, against a background of ivory brick.

American Hoist & Derrick Co., St. Paul, Minn., has removed its Dayton, Ohio, office to Indianapolis, at 703 New City Trust Building. I. R. Bailey and William M. Schoen will be at the new office.

Continental Steel Markets Improving But British Trade Is Still Quiet

(By Cable)

LONDON, ENGLAND, Nov. 17.

MIDLAND pig iron prices have been reduced 2s. 6d. (61c.) a ton. Business is generally dull, consumers refusing to enter into forward contracts. One furnace has been blown in on ferromanganese at Dinsdale, making 25 East Coast furnaces active, but only 7 producing foundry grades.

Italy and the Scandinavian markets are making fair purchases of East Coast hematite and domestic buying is moderate, so that consumption is probably exceeding output, but stocks are heavy.

Steel business is quiet, reflecting the absence of shipbuilding orders, which are normally the main tonnage of many mills. Certain large constructional and engineering contracts are still being executed. The Llanely Steel Co., employing 750, has suspended operation because of lack of orders.

Interest in Continental steel is awakening and there are indications that overseas consumers' stocks are at the lowest levels in years. Mild steel bar sellers are already asking increased prices, with several mills still out of the market because of the unprofitable level. Consumers here are inquiring, but more to test prices than with the intention of buying, as their own outlets are restricted.

Tin plate consumers are awaiting result of a makers' meeting Tuesday, when an announcement on the minimum price is expected. Non-members

British steel mill suspends operation, dismissing 750 workmen.

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Continental markets show slight improvement with steel bar prices advanced.

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German Government increases credit guarantee on Soviet Union purchases.

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Copper stocks in hands of German consumers smallest in years.

German Copper Stocks Smallest in Years

HAMBURG, GERMANY, Nov. 3.—Stocks of copper in the hands of German consumers are unusually low, estimated at about 900 tons in October, while the monthly consumption of copper by German industry is placed at 17,000 to 19,000 tons at the present reduced rate of operation.

One sizable consumer using 500 tons a month has a total stock of only 20 tons, and depends upon daily purchases from merchants and agents of the American copper exporters.

This policy of buying only for immediate needs is regarded by sellers here as extremely dangerous, as a cessation of shipments might necessitate closing many plants. Under normal conditions the copper consuming industry in Germany carries minimum stocks of 20,000 to 25,000 tons. Imports of copper in the first nine months of this year were 119,102 tons, compared with 127,061 tons in the same period of 1929, and 180,685 tons in nine months of 1928.

of the conference are quoting tin plate as low as 16s. 3d. (\$3.95) per base box, which is 9d. (18c.) per box less than the current schedule. Meanwhile, business is quiet.

Galvanized sheets are dull, despite offers to India of £11 15s. per ton (2.54c. per lb.), c.&f. Galvanized sheet prices to other markets are unchanged. Black sheets are quiet.

United Kingdom exports of pig iron in October totaled 30,000 tons, of which United States was sent 2700 tons. Total iron and steel exports were 265,000 tons.

German blast furnaces in the period from January to September are estimated to have increased their stocks of imported iron ore about 4,000,000 tons.

American Razor Blade Maker Buys in Sweden

HAMBURG, GERMANY, Nov. 3.—Swedish strip steel makers have recently closed a two-year contract with an American manufacturer of razor blades for a substantial quantity of high-grade strip steel.

Recently Swedish makers of wood

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at \$4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export.	£11 5s.	to £11 10s.	\$54.75 to \$55.95
Billets, open-hearth....	5 12½	to 6 5	27.34 to 30.41
Black sheets, Japanese specifications	12 5		59.61
Tin plate, per base box..	0 16½	to 0 17	3.95 to 4.13
			Cents a Lb.
Steel bars, open-hearth..	7 15	to 8 5	1.69 to 1.79
Beams, open-hearth....	7 7½	to 7 17½	1.60 to 1.71
Channels, open-hearth....	7 12½	to 8 12½	1.66 to 1.87
Angles, open-hearth....	7 7½	to 7 17½	1.60 to 1.71
Black sheets, No. 24 gage	9 0	to 9 5	1.95 to 2.01
Galvanized sheets, No. 24 gage	11 12½		2.52

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2 9½s. to £2 10s.	\$12.03 to \$12.15
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Billets, Thomas (nominal)	£3 6s.	to £3 7s.	\$16.06 to \$16.30
Wire rods, low C., No. 5			
B.W.G.	5 2½	to 5 7½	24.94 to 26.15
Rails, light	6 0		29.20
Black sheets, No. 31 gage, Japanese.....	11 5	to 12 12	54.68 to 58.32
			Cents a Lb.
Steel bars, merchant....	4 0	to 4 3	0.87 to 0.88
Steel bars, deformed....	4 0	to 4 3	0.87 to 0.88
Beams, Thomas, British standard (nominal)....	3 14	to 3 15	0.81 to 0.82
Channels, Thomas, American sections	5 12	to 5 14	1.24 to 1.26
Angles, Thomas, 4-in. and larger, over ¾-in. thick	3 14	to 3 15	0.81 to 0.82
Angles, Thomas, 3-in....	3 19	to 4 0	0.86 to 0.87
Hoop and strip steel over 6-in. base.....	4 17½	to 5 0	1.06 to 1.09
Wire, plain, No. 8 gage..	3 15	to 3 17½	0.84 to 0.85
Wire, barbed, 4-pt. No. 12 B.W.G.	9 12½		2.09
Wire nails, base.....	5 15		\$1.26 a keg

screws have been obtaining most of the American import business. British, Austrian, Belgian and German makers of wood screws have withdrawn from selling in the United States following an agreement to protect the American domestic industry in exchange for certain Far Eastern markets. Swedish makers, however, did not participate in the agreement, so that users of foreign wood screws in the United States have turned to Sweden as a source of supply.

Soviet May Discuss Manganese Ore Sales

HAMBURG, GERMANY, Nov. 3.—Soviet manganese ore producers are understood to have recently expressed willingness to consider agreements with other producers for division and maintenance of markets. This is believed to be the result of claims that the Russian product is being "dumped" and activity of foreign producers which might develop into concerted action against Caucasian manganese ore.

Germany Exacts Higher Guarantee from Soviet

BERLIN, GERMANY, Nov. 5.—Credits advanced by the German Government to the Soviet Union have been advanced from 50 per cent to 70 per cent of total amount of invoice. This action was taken at the request of the German steel, hardware and machinery producers, who are about to book some substantial orders for shipment to the Soviet. When guarantee of credits by the Government was instituted about four years ago, the amount was only 50 per cent of the invoice. All drafts have been regularly paid on these credits by the Soviet trade delegations.

Australia Applies Duty on British Fencing

WASHINGTON, Nov. 18.—Australia has fixed a British preferential duty of \$13 a gross ton (52s.) on iron and steel wire fencing, Nos. 8 to 14, but left the general duty at \$30 (120s.). Previously British shipments were free of duty. The changes were effective Nov. 8.

Frigidaire to Be Made in Germany

HAMBURG, GERMANY, Nov. 3.—The Opel works at Russelsheim, subsidiary of the General Motors Co., will shortly begin the manufacture of Frigidaire electric refrigerators.

Midland Steel Receives \$1,000,000 Orders

The Midland Steel Products Co., Cleveland, reports that it has taken new orders totaling approximately \$1,000,000 from two large automobile companies for automobile frames and four-wheeled brakes for 1931 delivery.

German Steel Sales to Japan Gaining

YOKOHAMA, JAPAN, Oct. 1.—German steel producers and exporters are steadily gaining influence in the Japanese market and are leading in the supply of certain steel products formerly furnished largely by the United States or Great Britain. Japan furnishes a large part of current requirements from domestic sources, but it is still necessary to import certain products for which capacity has not been sufficiently increased. Electrical sheets, tin plate, wire rods, steel hoops, plates heavier than 0.7 mm. and steel tubing are all made by Japanese mills, but a substantial tonnage is imported annually.

Of Japan's electrical sheet requirements purchased abroad in 1929, the United States furnished 5590 metric tons, Great Britain 2313 tons and Germany 2195 tons. The United States led in furnishing tin plate, shipping 52,117 tons compared with 28,526 tons received from Great Britain. Germany led in furnishing Japanese imported requirements of wire rods, steel hoops, plates and tubing, having shipped 82,201 metric tons of wire rods, compared with 25,827 tons from the United States, 35,707 tons of hoops compared with only 349 tons from the United States and 10,605 tons from Belgium, 33,996 tons of heavy plates compared with 6823 tons from the United States, and 25,888 tons of steel tubes compared with 20,561 tons from the United States.

Canadian Tin Plate Duties Raised Nov. 1

WASHINGTON, Nov. 18.—The recent advance in the Canadian duties on tin plate, according to the Minister of National Revenue, was prompted by the fact that this product is now being made within the Dominion, says a report received from Commercial Attaché Lynn W. Meekins, Ottawa. The main production is in the Province of Ontario, where, it is stated, there is a capacity of 1,200,000 base boxes annually. The new duties, effective Nov. 1, are 7½ per cent under the British preference; 12½ per cent under the intermediate column, applying to nations having commercial treaties with Canada, and 15 per cent under the general column, applying to the United States and other non-treaty countries. Formerly British imports were entered free and the intermediate and general duty was 5 per cent.

Imports of tin plate in Canada came almost entirely from the United States and the United Kingdom, with the United States supplying more than twice as much as the United Kingdom. Imports in the first eight months of 1930 totaled 1,200,340 base boxes, valued at \$5,968,152, of which the United States supplied 809,790 boxes, valued at \$4,176,455, and the United Kingdom 390,550 boxes, valued at \$1,791,698. In the calendar year 1929

imports were 1,645,766 boxes, valued at \$8,200,692, of which the United States furnished 1,040,773 boxes and the United Kingdom 604,995 boxes.

Value of Manufactures in 1929 was 68 Billions

WASHINGTON, Nov. 17.—The total value (at f.o.b. factory prices) of all manufactured products reported to the Bureau of Census for 1929 by 199,268 establishments was \$68,453,486,516, exceeding by 9.1 per cent the corresponding total of \$62,718,347,289 for 1927, reported by 191,866 establishments, and by 10.3 per cent the total of \$62,041,795,316 reported for 1919 by 214,383 establishments.

The number of wage earners (average for the year) in 1929 increased 2.4 per cent over 1927, from 8,349,755 to 8,550,284 and wages increased 3.9 per cent, from \$10,848,802,532 to \$11,271,016,618.

As compared with 1919, the 1929 changes are as follows: Value of products, increase of 10.3 per cent; number of wage earners, decrease of 5 per cent; wages, increase of 7.7 per cent.

The report said that because of the substantial decline in wholesale prices between 1919 and 1929, the rate of increase in value of products does not reflect the true increase in production during the 10-year period. It was also stated that in making use of the statistics for 1929 it should be borne in mind that the cost of materials and the value added by manufacture are not strictly comparable with the corresponding figures for 1927 and 1919, because of the exclusion from the current figures and the inclusion in the earlier ones of data for mill or shop supplies.

Further Shrinkage in T-Rail Trackwork Shipments

October shipments of trackwork for T-rail track of 60 lb. a yard and heavier—5192 net tons—made a new low record, declining 8 per cent from the 5642 tons shipped in September. In October, 1929, shipments totaled 12,902 tons, according to the American Iron and Steel Institute.

For the 10 months the aggregate has been 100,730 tons, a drop of 28 per cent from the 139,963 tons shipped in the first 10 months of 1929.

Factory Earnings Rise Further

An increase in average weekly earnings in representative New York State factories in September brings the figure back about to the May level. It is the second rise since the low point was reached in July. The September average was \$28.94, which is 35c. higher than in August and 44c. higher than in July. It compares, however, with \$30.47 in September, 1929, and is the lowest figure for any September since 1925.

